OCTOBER 1954

PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

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POWDER METALLURGY
PERMANENT MOLD CASTINGS
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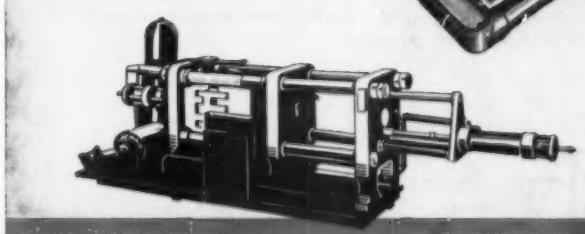

Faster set-up time is just one of the many "bonus" features which make Cast-Master today's outstanding choice in die-casting machines. To get the complete "bonus" story, send for the Cast-Master catalog, containing illustrations and specifications on eight new models.

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thanks to ACCUMET PRECISION INVESTMENT CASTINGS

This bolt-making machine transfer arm used to be machined from a forging of SAE 1045 steel. A grooved pin had to be machined and assembled in the forging, and many milling, broaching and drilling operations were needed to produce the finished part.

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OCTOBER, 1954
Volume 12 Number 10

PRECISION METAL MOLDING

DIE CASTINGS • INVESTMENT CASTINGS • PLASTER MOLD CASTINGS
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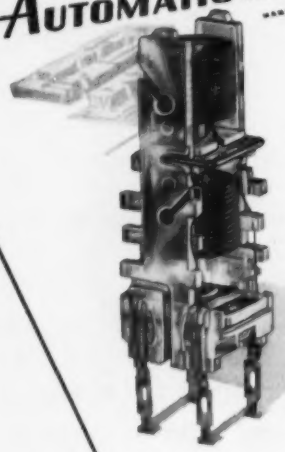

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The puzzling problems encountered by designers can often be solved to advantage by cooperative effort with the seasoned and skilled mechanics at Madison-Kipp.

The "key" here illustrated required a .040" steel insert for "interpreting" a pre-punched tape. To hold the insert in place while casting, a U-shaped wire form is utilized. After casting the wire is cut to size as illustrated.

If you think you can use die castings in your product, please write to our home office in Madison.

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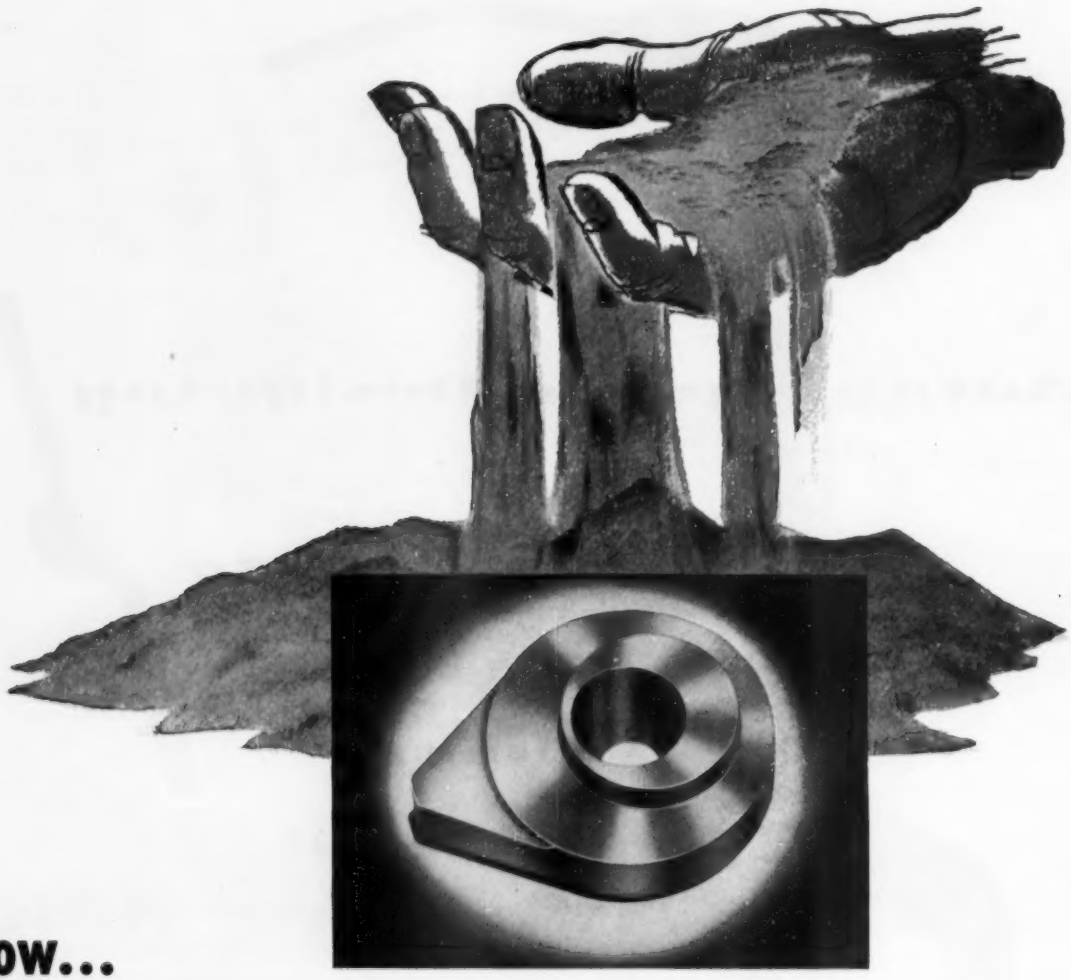

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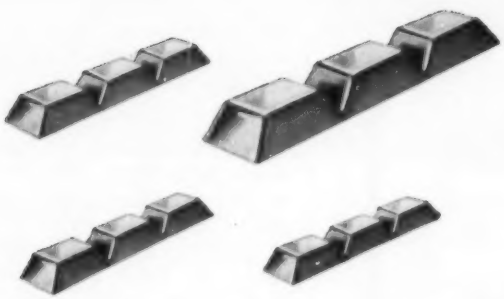
...FACTS YOU NEED TO KNOW ABOUT ALUMINUM INGOT FROM SMELTERS



Aluminum Smelters' products are designed for Foundries

The alloys produced for you are the major items of aluminum smelters—80% of their business is *your business.* Therefore, casting alloys are the *main endeavor*—not a sideline to be pursued "when, as, and if".

Smelters have no tie-in or integration with any wrought product mills

That's why smelters have always been, and continue to be, *the one reliable* source of supply for FOUNDRIES. Regardless of the demand for other products, the aluminum smelters' efforts are centered on casting alloys *for you.*

The record proves the facts

The histories of the Aluminum Casting Industry and the Aluminum Smelting Industry prove their interdependence. The growth of each has paralleled and depended upon the growth of the other.

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no foundry ever shut down because ingot was not available from smelters!

ASR

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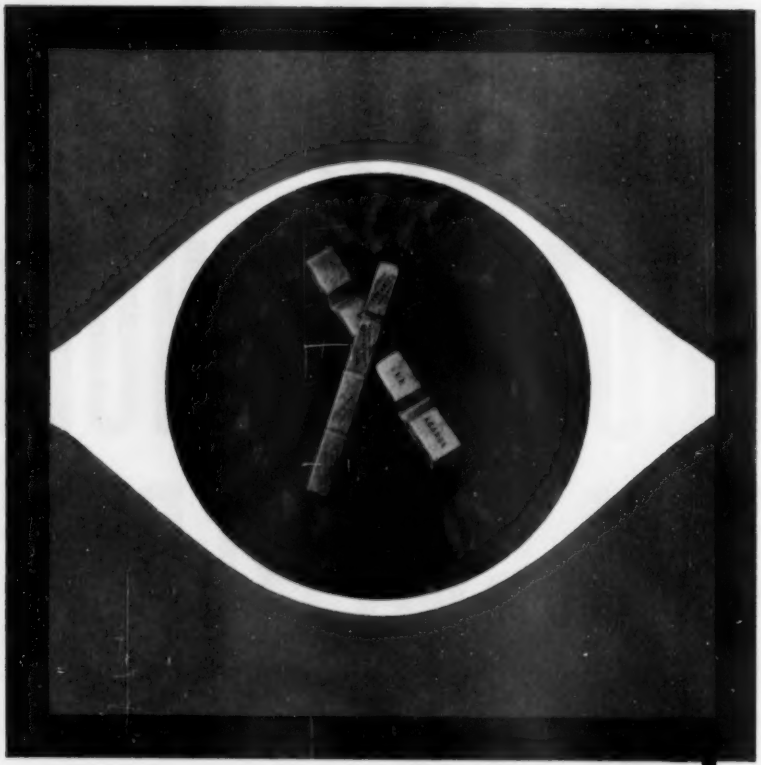

Let's look at the facts about die casting metals

Most people claim aluminum and zinc die cast alloys are pretty much the same wherever you buy them. Maybe. But that's not the point.

You want more than the *product* when you buy metal. You want *service* from your supplier.

Federated service gives you:

1. Research, constantly working to give you a new and better metal.
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Letters to the editor

PAINT SPRAY MACHINES

I've been reading an article in your Precision Metal Molding Magazine, the June issue. The article was written by C. W. Scantlebury, engineer of Finish Engineering Company. The title of the article is "You Can Get Faster Paint Spraying With Mechanized Equipment." There are a few illustrations in this article that deal with metal castings.

I have a paint spraying problem on a plastic piece, which I would like very much to have mechanized to increase our production. I would appreciate it if you would forward the necessary information to the Finish Engineering Company in regard to getting the setup for mechanized paint spraying on plastic pieces.

—N.J.H. (Vice President)

Information and address have been forwarded. The problem of spray painting a molded plastic piece is quite similar to that of spraying a die cast piece because, in each instance, the shapes and contours are likely to be difficult to mask. For this reason, methods of obtaining special masks, and of mechanizing the painting for large volume production, are similar for plastics and die castings.—Ed.

WAXES FOR INVESTMENT CASTING

I would sincerely appreciate any information you can give me concerning the types of waxes used in investment casting, their characteristics and sources of supply.—W.J.M.

Sources of supply have been submitted, and reference is made to a text book available on the investment casting process, "Investment Castings for Engineers," by Wood and Von Ludwig (Reinhold).—Ed.

Continued on page 10

Vanadium-Alloys Steel Company

first quality* Die Steels for hot work

made with the craftsmanship of lifetime specialization in Tool Steel—exclusively

Hotform The first 5% chromium hot work die steel—still first in strength and toughness combined with high resistance to heat checking. *Uses:* die casting dies, dummy blocks, extrusion dies, backer blocks, mandrels, hot piercers, hot forging dies.

Forge Die Resists softening at elevated temperatures, stays put under impact. 14% tungsten content. *Uses:* forge die inserts, extrusion dies, gripper dies, hot pressing dies, dummy blocks, hot piercing tools.

SC Special 14% tungsten plus increased carbon for higher wear resistance. *Uses:* hot forging dies and punches, extrusion tools, hot forming rolls.

Marvel 10% tungsten for high resistance to high temperatures. *Uses:* brass forging dies, extrusion press tools, nut dies and piercers, hot shears, hot swaging dies.

Hotpress Outstanding tungsten die steel with excellent toughness for work at elevated temperatures. *Uses:* dummy blocks for brass extrusion, press dies, extrusion dies, upsetting dies.

WW Hotwork Highly alloyed for greatest wear resistance at high temperatures. *Uses:* copper and brass extruding dies, brass die casting dies, copper tubing piercers, nozzles for zinc die casting machines.

Red Cut Superior—J Temper

Tungsten High Speed Die Steel, with high hot hardness and wear resistance qualities. *Uses:* hot press dies for copper and brass, extrusion dies, hot and cold trim dies, punches, heading dies.

*guaranteed by deep etch, magnaflux, zyglo, and supersonic testing

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WHY POWDER METALLURGY?

. . . Because Powder Metallurgy is the speedy, lower cost method of producing small metal parts with blueprint accuracy.

Parts may be so pressed and sintered that costly machining is eliminated or simplified.

Parts can be produced to close tolerances. For economy, there's no wasted metal—since die overflow powder can be reused.

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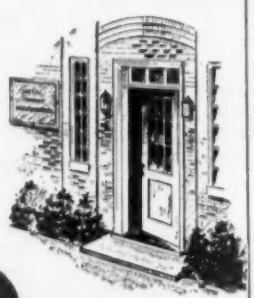
. . . Because nearly forty years of research and manufacturing experience have made MD the Headquarters for highest quality Metal Powders for every Powder Metallurgy need.

MD, the pioneer Metal Powder producer, is the *only* company producing *a complete line* of powders of such a wide range of metals and their alloys.

Remember
One Call
Does It All!



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LETTERS TO THE EDITOR
continued from page 8

ROTATING BANDS

It has just been brought to the writer's attention that the May issue of Precision Metal Molding carried a very interesting article on the Powdered Iron Rotating Bands.

In 1951 we made some of these bands for Frankford Arsenal. However, on these particular bands, it was not necessary for us to machine the pieces.

In the article it was stated that the Powder Metallurgy Committee developed a design of a cutting tool. We are interested in any information which may be available as to the design of this, or any other type of tool, with respect to the machining of powdered metal parts.—H.R.F. (Estimating Department)

We do not have the actual design of the cutting tool, but have referred reader H.R.F. to the chairman of the American Ordnance Association powder metallurgy committee, who furnished us with the data for the article. We assume that, since the design of cutting tools was developed cooperatively, it is likely to be available to all interested parties.—Ed.

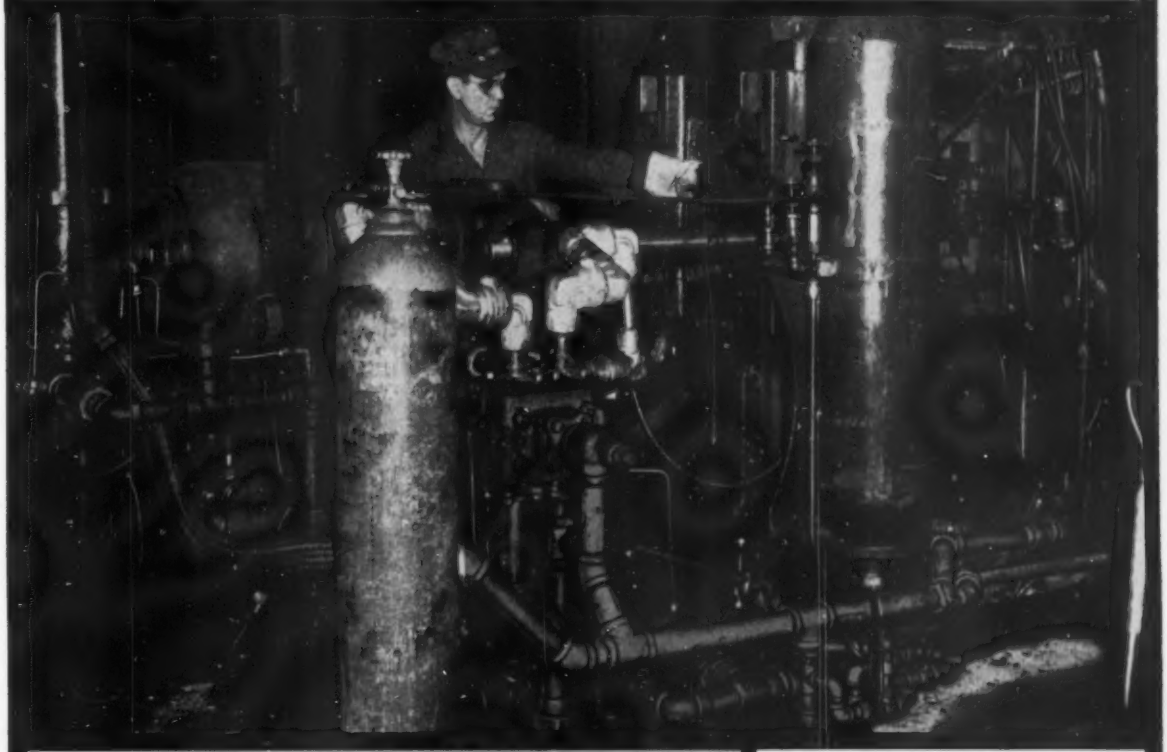
SHORT RUN SOURCE . . .

Will you recommend several sources for casting, in short runs, the part shown on our print (Enclosed.—Ed). Typical run would not exceed 1 thousand pieces.—S.F.

Sources have been suggested. The part in question is to be cast in antimonial lead. It is rectangular in shape measuring 1.027 x 1.000 x 0.172 and has a knurled stainless steel insert in one side. —Ed.

How Mall Tool Puts Safety in Hydraulic Lines

FIRE-RESISTANT PYDRAUL F-9



How to make die-casting machines safer for operators, more efficient in production? Mall Tool, manufacturer of more than 1000 separate portable items—many of them die-cast—does it this way:

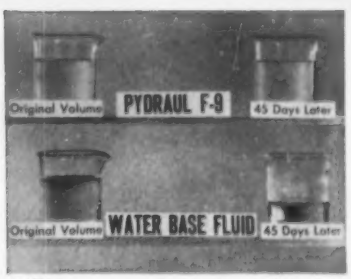
One by one, they are converting their machines to Pydraul F-9. Under test, this remarkable hydraulic fluid will not sustain flame even when sprayed into a 6000° F. oxyacetylene jet. If a hose should rupture, Pydraul would spray harmlessly into pots of liquid metal or even into furnace flames.

No waste, no corrosion. Mall finds oil make-up per machine averages 60% less with Pydraul than with ordinary fluid. Pydraul has a chemical base—not water or petroleum—and is noncorrosive to metal parts. It can be re-used again and again with no loss of lubricating characteristics.

Soon all Mall hydraulic machines will have Pydraul in their lines.

Pydraul's recent price reduction makes it more than ever the most economical fire-resistant fluid in actual use.

Write for this engineering report, "Pydraul F-9."
Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478, St. Louis, Missouri.



37% less evaporation in Pydraul than in water-based fluids . . . one reason why make-up rates are many times lower with the Monsanto fluid.

Pydraul: Reg. U. S. Pat. Off.

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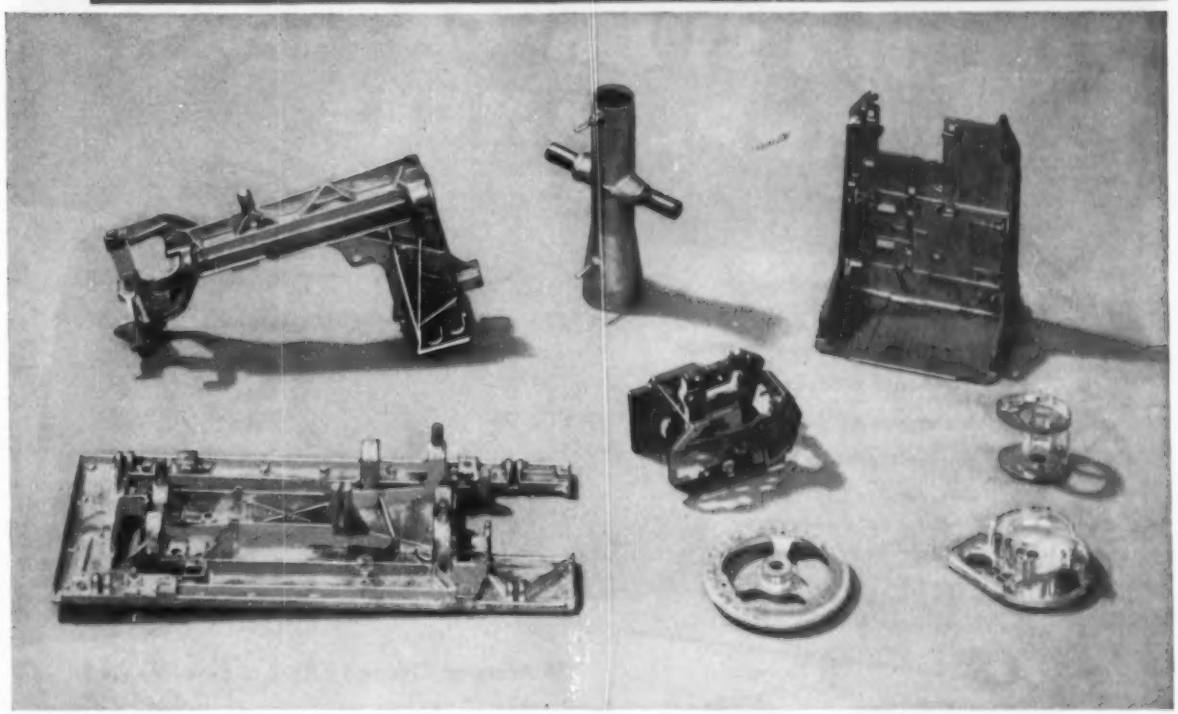

COMBINE PARTS IN ONE DIE CASTING

Substantial savings in production costs can often be realized by combining several parts into one Precision die casting. Precision's ability to produce die castings using intricate dies and coring methods offers you almost unlimited possibilities in savings.

You benefit two ways — the cost of producing one die casting is usually less than the sum of several of its parts in smaller castings. Secondly, you eliminate the assembly costs involved in putting together the smaller parts.

We'd be glad to discuss your problems with you and show you how you can cut costs.

Write for complete information TODAY!

PRECISION CASTINGS CO., Inc.
212 Walnut St., Fayetteville, N. Y.
Syracuse, N. Y. · Cleveland, O. · Chicago, Ill.
Kalamazoo, Mich. · Cortland, N. Y.
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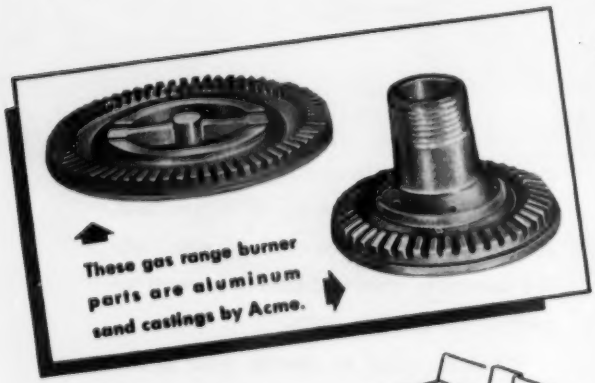
ACME ALUMINUM & MAGNESIUM CASTINGS FOR APPLIANCES

● An aluminum grill casting produced for a modern range. Acme also produces grill castings with the heating elements cast in as a complete unit.

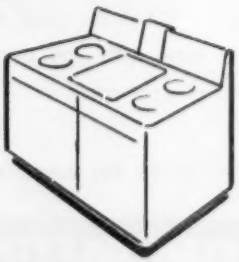


These gas range burner parts are aluminum sand castings by Acme.

● Acme of Chicago offers a *complete engineering service* with over 33 years of engineering and foundry experience back of this service.

● Acme of Chicago also offers a *complete casting service*. Whether your requirements are for ten or hundreds of thousands of castings of a single design — for light metal castings weighing a few ounces or hundreds of pounds — or for aluminum and magnesium heat treated and aged castings to meet military specifications — we are interested in working with you.

Your inquiries and requests for information are always welcome



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PROSPECT 6-5035

ACME ALUMINUM FOUNDRY CO.

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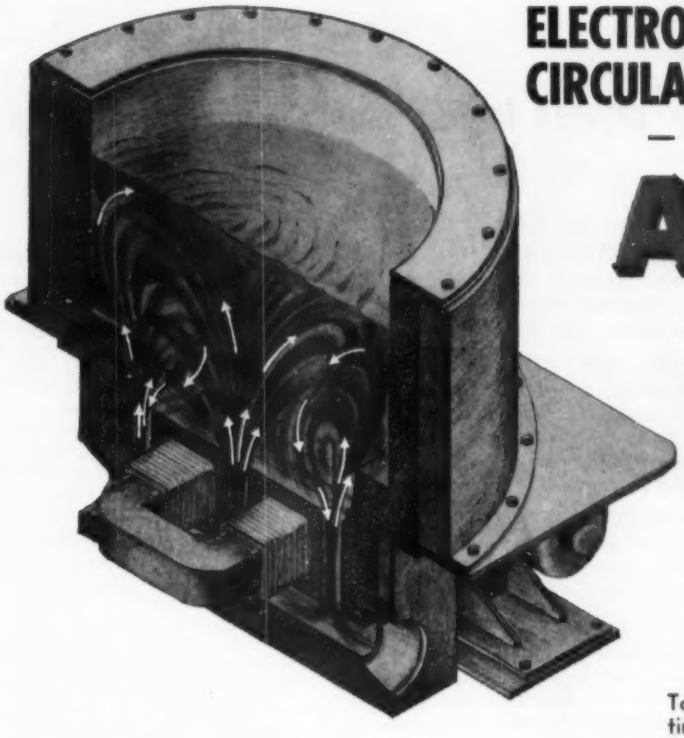
The Furnace that Stirs Itself!



ELECTROMAGNETIC PRESSURE CIRCULATES MOLTEN METAL

— In this 60 Cycle —

AJAX TAMA-WYATT *Induction Furnace*

Heat is generated only in the melting channels. Controlled stirring *(neither too much nor too little)* guarantees uniformity of metal temperature and alloy composition and also leads to efficient melting of light scrap. Tiresome puddling is eliminated. The metal is held entirely in an inert refractory lining. The atmosphere is cool and free from contaminating gases.

No Other Method Enables such Completely

CONTROLLED MELTING

Today, AJAX builds a complete line of these time-tested furnaces in standard sizes up to 333 kW for the dependable melting of aluminum, brass, copper and zinc. Units for special applications are carefully engineered to specifications.

TWIN COIL INDUCTORS

Lead Non-Ferrous Melting

The sectional view above shows the twin coil stirring action of the 100 kW Ajax-Tama Wyatt 60 cycle induction furnace. Heat induced in the secondary channels below is conveyed throughout the melt by electromagnetic circulation as shown by the arrows. The 100 kW furnace shown here, which will be on display at the 1954 Metal Show, is one of a family of twin coil furnaces available today for melting rates from 300 to 10,000 lbs. per hour.

We cordially invite you to inspect the 100 kW AJAX furnace exhibited at the NATIONAL METAL SHOW, Chicago, Nov. 1-5, 1954, Booth #752.

AJAX TAMA-WYATT

AJAX ENGINEERING CORP., TRENTON 7, N. J.

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

For more information circle No. 5 on the Reader Service Card

Reference Data offered in this month's advertisements

3. DIE LUBRICANT for fast, efficient casting release in die casting is described in bulletin 426-K and reprint DC, both available from Acheson Colloids Co.

7. FROZEN MERCURY investment castings are described and their advantages reported in bulletin 706 on mercastings, offered by Alloy Precision.

13. METALLURGICAL SPECS covering all of the alloys prepared by Apex Smelting Co. are contained in bulletins available from the company.

15. CARBONYL IRON POWDER, its uses and properties, are given in a 32-page book. Numerous photomicrographs, diagrams, charts and tables are given in the book published by General Analine & Film Corp., Antara Chemicals Div.

16. DESIGNING INVESTMENT CASTINGS and proper alloy selection are given in a new booklet prepared by the Arwood Precision Casting Corp.

19. POWDER COMPACTING PRESSES are described and complete technical and engineering information is given in new bulletins available from Baldwin-Lima-Hamilton Corp.

20. POWDERED METAL PARTS equal to machined parts in strength, physical properties and at lower cost are described in Bulletin SM-54 from the Bassick Co.

21. SPECIAL ALLOYS for investment casting are described and the chemistry, mechanical and physical properties given in the new Master-Met Alloy Bulletin from Cannon-Muskegon Corp.

22. DIE CASTING MACHINE catalog giving all of the necessary information on all models is now available from Cast-Master, Inc.

28. ADVANCED POWDER METALLURGY, a booklet from Dixon Sintaloy, Inc., describes the facilities and gives some technical data on the parts that this company can make.

30. RESISTOX METAL POWDERS of all kinds are described in data sheets that have been prepared by the Glidden Co.

31. TINY DIE CASTINGS and the automatic methods of production used by Gries Reproducer Corp. are described and illustrated in a bulletin now available.

37. DIE CASTINGS — an engineering report on the Hoover Co.'s facilities and services is available from the company.

41. CONTROLLING OIL TEMPERATURES is the subject of Bulletin 1.1K5, published by Kewanee-Ross Corp.

42. SMALL MELTING FURNACES for experimental and batch operations are described in a bulletin on type GMS Detroit Rocking Furnace, available from Detroit Electric Furnace Div., Kuhlman Electric Co.

44. DESIGN INFORMATION for die castings in the light metal alloys is offered by Litemetal Dicast.

46. HIGH PHYSICAL properties in powdered metal parts by use of nickel-chromium alloy powders are reported in literature from Metal Hydrides.

To get copies of any item listed here, simply circle the appropriate number on the Reader Service Card bound into this issue.

49. NON-FLAMMABLE HYDRAULIC fluid. — The properties and uses of Pydraul F-9 are described in a technical report published by the Organic Chemicals Div. of Monsanto Chemical Co.

54. BRASS POWDER, technical report is contained in a 32-page booklet published by the New Jersey Zinc Co. giving the properties of brass powders and typical properties of compacts made from the powder.

57. A DIE CASTER who offers a brochure showing the company's die casting facilities and general information on die castings, is Precision Castings Co., Inc.

60. DIE CASTING facilities of the Racine Die Casting Co. are described in a new brochure that has recently been issued.

66. PLASTER MOLD CASTINGS are the subject of literature from Universal Castings Corp., listing alloys, properties, etc.

67. WAX MELTING POTS for use in making patterns for investment casting are presented in a catalog from StaWarm.

69. POWDERED METAL PARTS, their engineering properties and applications are discussed in a booklet available from Yale & Towne Mfg. Co., Powdered Metal Products Div.

70. IRIDITE PROTECTIVE coatings for zinc die castings are introduced in literature from Allied Research.

71. BARREL FINISHING abrasives are discussed in an informative booklet prepared by Almco Supersheen.

Continued on page 18

Here's what 4 EXPERTS say about MERCASTINGS* by ALLOY PRECISION

Manager of Quality Control
A. L. LAMBERT
"Mercastings gave us a better product. Rejection rate much lower than anticipated. Inspection problems were simplified."

Chief Inspector
J. A. GALLAGHER
"Inspection work load was eased which meant work went through faster and saved us man-hours."

Manager of Manufacturing Engineering
F. H. ROHRIG
"In addition to cutting costs drastically, we freed valuable manpower and space for other vital projects."

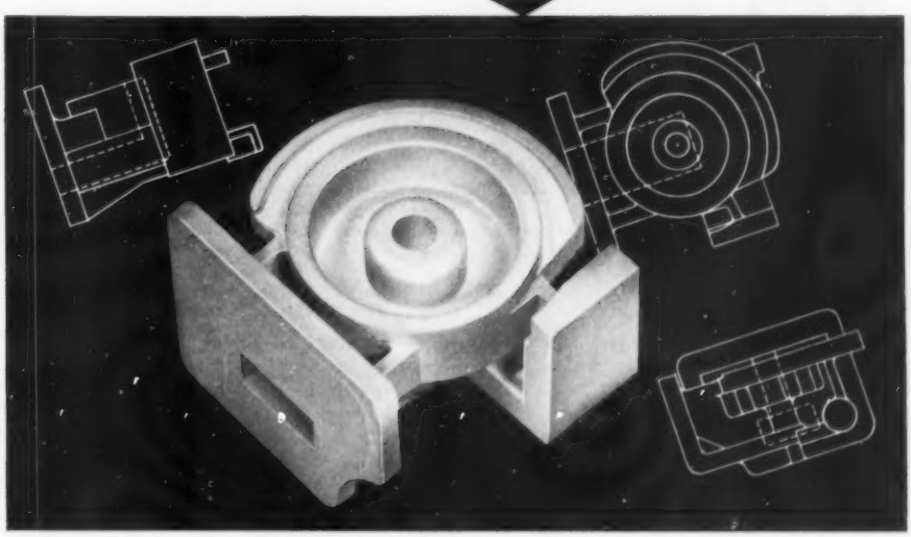
Supervisor of Subcontracting
R. J. LOMMA
"We're sold on mercastings. And when Alloy Precision makes them we know they'll be to specification."

Design of electronic plumbing parts for economical production poses unusual difficulties. This wave guide, for example, if made by traditional methods, would consist of a fabricated unit of over 25 parts. Its assembly would involve machining to extreme tolerances . . . costly precision jigging . . . brazing . . . silver soldering . . . all by skilled craftsmen not available on today's labor market.

Seeking an improved production technique, The W. L. Maxson Corporation engineers decided mercasting — by Alloy Precision—was the only practical solution. Now this part is cast as a single unit in 356-T6—to a tolerance of ±.003 inch/inch. Result is that production is up...costs and rejects are down.

This is just one instance of the trend toward mercastings—by Alloy Precision—to slash manufacturing costs. Perhaps it will suggest to you how this versatile metal working process cuts down your production of useless metal chips . . . *increases your production of parts for profit.*

A-8070



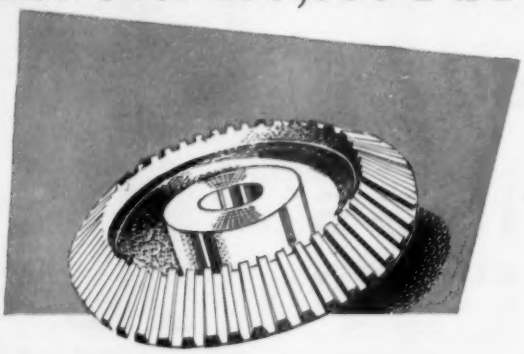
* FROZEN MERCURY INVESTMENT CASTINGS

Photos: Courtesy The W. L. Maxson Corporation, Old Forge, Pa.

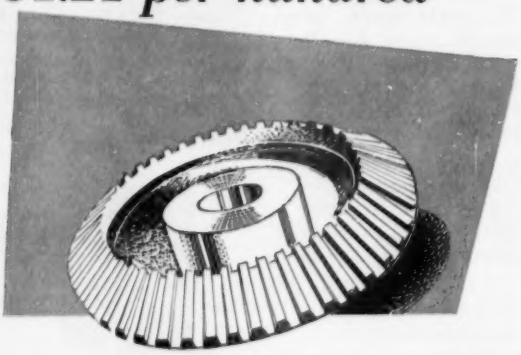
ALLOY PRECISION *Castings Company*
DEPT. G-62
EAST 45th ST. AND HAMILTON AVE. • CLEVELAND 14, OHIO

For more information circle No. 7 on the Reader Service Card

With Tensiles Over 100,000 PSI



one costs $31.21 *per hundred*



and one costs $22.51 *per hundred*

Why?

With reduced iron powders in both cases ... the expensive compact derives its physicals from copper infiltration; the inexpensive compact from small additions of Metal Hydrides' chromium-nickel pre-alloyed powders. The comparative facts below show how you can achieve the physicals you need ... in less than half the steps ... at impressively lower cost with the MH process.

Copper Infiltration	MH Chrome-Nickel*
Cost — $31.21 per 100	Cost — $22.51 per 100
Tensile — 112,000 PSI	Tensile — 103,000 PSI
Elongation — 1%	Elongation — 2.5%
Rockwell Hardness — C34	Rockwell Hardness — B100
Apparent Density — 7.78	Apparent Density — 6.83
Production Steps — Nine	Production Steps — Four

**(7½% addition of 50% chrome/ 50% nickel, plus 1% carbon)*

Without obligation our technical sales staff will gladly give you complete information and show you how chromium-nickel pre-alloyed powders will meet your requirements. Write today!

Pioneers In Hydrogen Compounds

Metal Hydrides
INCORPORATED
20 CONGRESS ST., BEVERLY, MASS.

For more information circle No. 46 on the Reader Service Card

REFERENCE DATA
continued from page 16

72. ABRASIVE BELTS, their lubrication and uses, are given in a reprint being distributed by Behr-Manning Div. of Norton Co.

73. AIR MOTORS, their uses and how production costs can be cut with them is told in Bulletin CL-50 from the Bellows Co.

75. TAPPING & THREAD-CUTTING screws for various types of applications are the subject of literature from Central Screw.

76. CONVERSION COATINGS. Chromate type conversion coatings for a wide variety of uses on many different metals are described in technical data sheets from The Chemical Corp.

77. BARREL FINISHING catalog from Grav-i-Flo includes complete equipment, accessories and supplies for barrel tumbling of die castings and other metal parts.

79. BARREL FINISHING MACHINES developed by Minnesota Mining and Mfg. Co. are described in folders from the company.

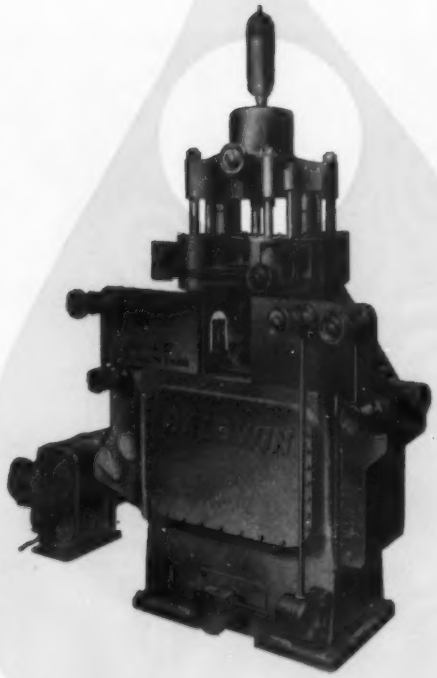
81. FINISHING COMPOUNDS for use with barrel finishing machines are completely described and their properties given in detail in a booklet prepared by Oakite Products, Inc.

83. SURFACE FINISHING by the Roto-Finish method is described and illustrated in a new circular now available.

86. STANDARD DIE ASSEMBLIES for die casting, including cavity retainer sets and ejector boxes, are subject of specification sheets and price lists from Detroit Mold.

HYDRAULIC HEAD

avoids overloading, controls densities, in new Baldwin powdered metal presses . . .



See the Model "L" in action at Baldwin's Booth 1065, 36th National Metal Congress & Exposition, International Amphitheatre, Chicago, November 1-5.

YOU'LL GET a whale of a lot more by specifying a Baldwin Model "L" or Model "C" for your next powdered metal press. Why? Because these new Baldwin presses are the very first designed specifically for compacting powdered metals.

Here's just one of the reasons why it'll pay you to standardize on Baldwin to take care of your pressing needs . . .

Both the 50 ton ("L") and 100 ton ("C") presses feature a hydraulic head which supplies opposing pressure for the upper punch. It works like this: if the compressing pressure exceeds the setting of the hydraulic accumulator, the upper punch "gives" to the limit of the setting . . . that enables the hydraulic head to benefit you in three very vital ways:

1. It prevents overloading of the press, thus prolonging the life of both tools and press.
2. It makes it possible to compact powdered metal parts to more uniform densities.
3. It permits use of more delicate tools.

For copies of new bulletins with full technical information on Models "L" and "C" please write to our Department 4556, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pennsylvania.

BALDWIN BLH LIMA-HAMILTON

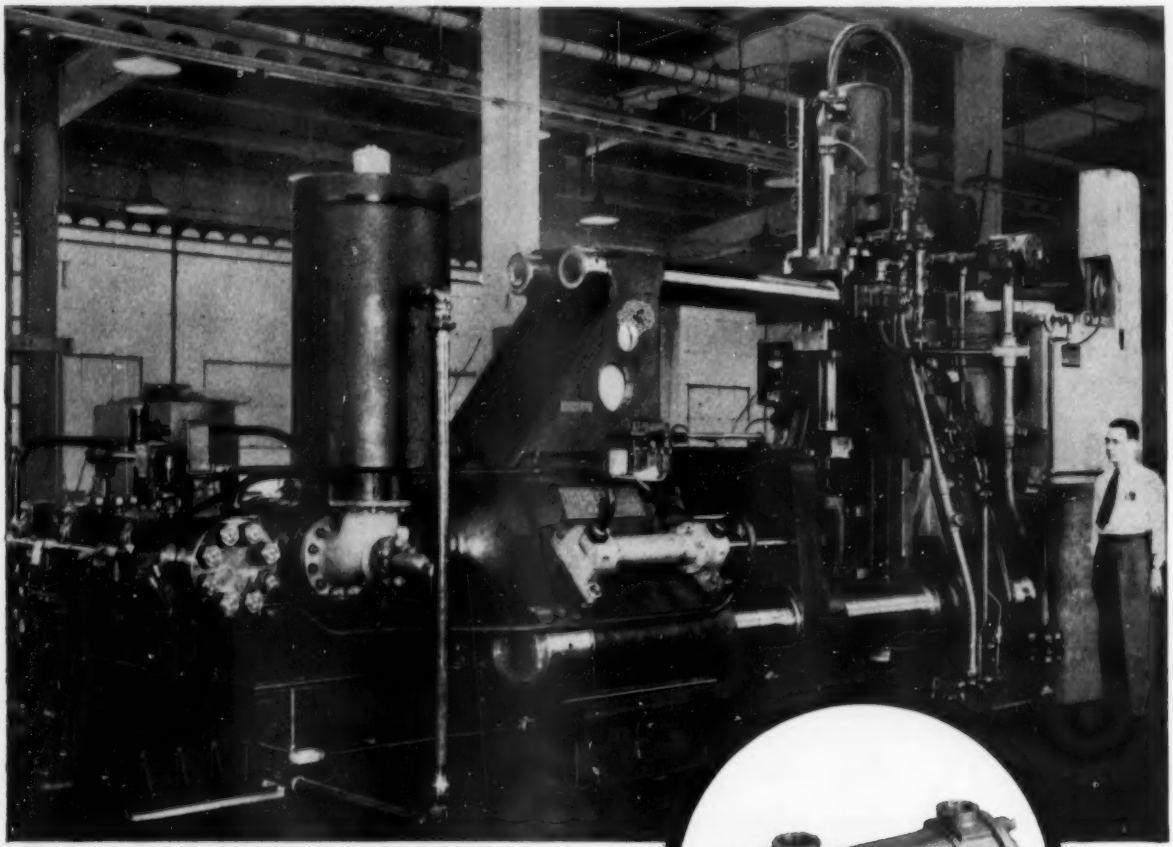
BALDWIN-LIMA-HAMILTON

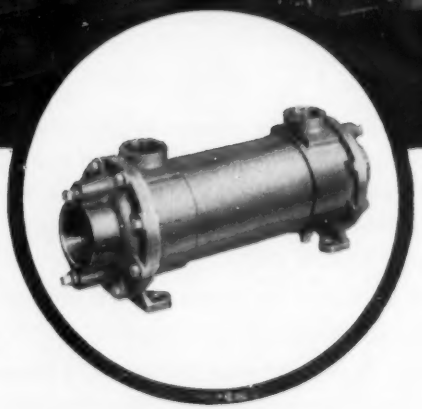
Philadelphia 42, Pa. • Offices in Principal Cities

For more information circle No. 19 on the Reader Service Card

CONTROLLING OIL TEMPERATURE

while this giant Hydropress produces 15 lb. die castings





ROSS EXCHANGER

Occupying a floor space of 22′ x 5′8″ and extending 14′ above floor level, this Hydropress Cold Chamber Die Casting Machine is said to be one of the world's largest. With a maximum injection pressure of 80 tons and a total clamping pressure of 1,000 tons, it is designed to produce castings weighing up to 15 lbs.

To insure peak press capacity by providing dependable oil cooling, Hydropress, Inc. equipped this machine with a Ross Type BCF Exchanger. *Pump slippage from overheated, thinned oil is most effectively prevented.*

Preferred for numerous types and makes of hydraulic machinery, Ross Exchangers are ruggedly built to withstand punishing hydraulic shock. Tough, ductile seamless copper alloy shells and brass forgings can well absorb the extra load.

Pre-engineered and fully standardized, compact Ross Type BCF Exchangers are stocked in a wide range of sizes to meet most needs . . . *promptly.*

For detailed information, request Bulletin 1.1K5.

KEWANEE-ROSS CORPORATION

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

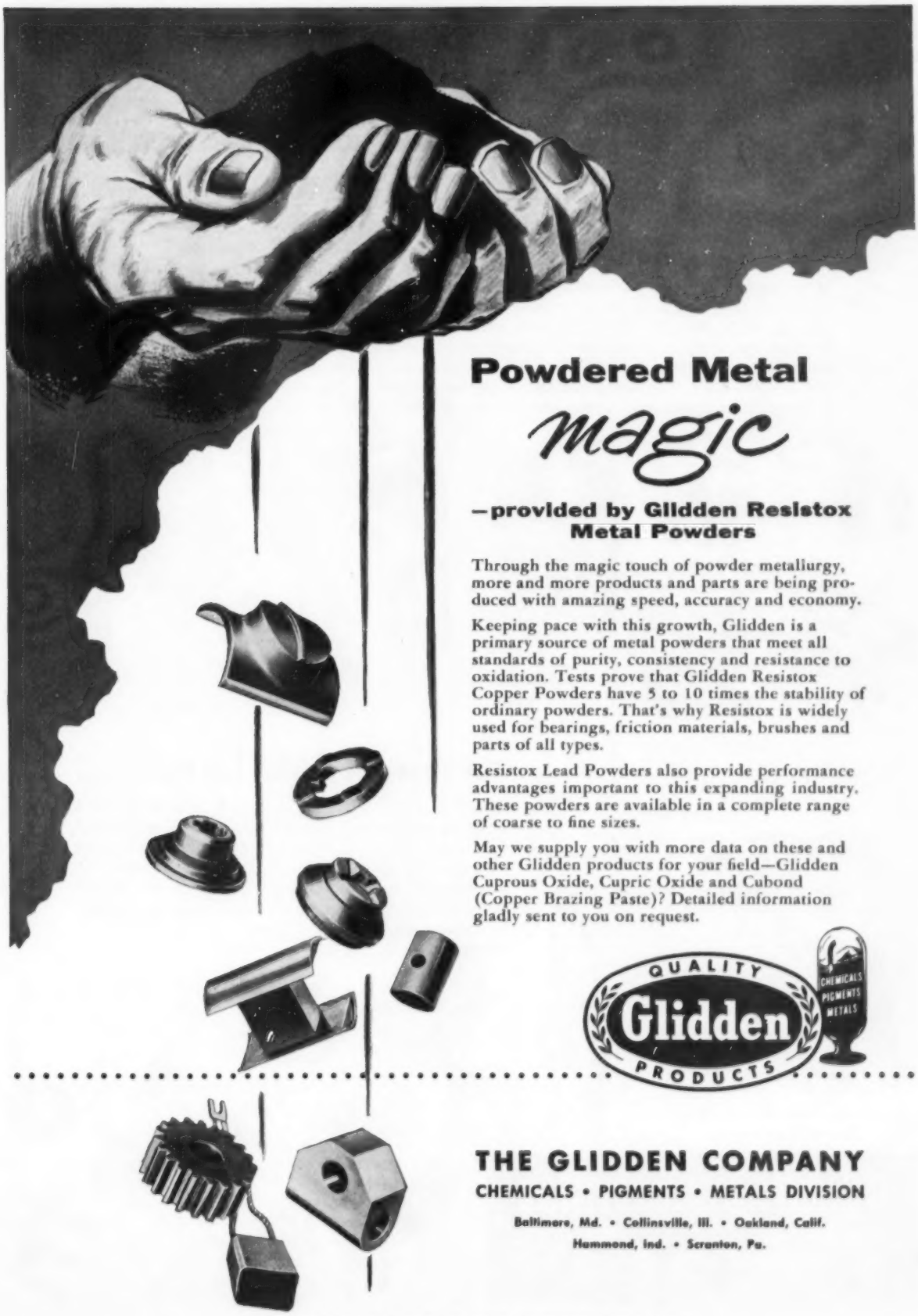
1446 WEST AVENUE • BUFFALO 13, N. Y.

In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

ROSS

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

For more information circle No. 41 on the Reader Service Card



Powdered Metal *magic*

—provided by Glidden Resistox Metal Powders

Through the magic touch of powder metallurgy, more and more products and parts are being produced with amazing speed, accuracy and economy.

Keeping pace with this growth, Glidden is a primary source of metal powders that meet all standards of purity, consistency and resistance to oxidation. Tests prove that Glidden Resistox Copper Powders have 5 to 10 times the stability of ordinary powders. That's why Resistox is widely used for bearings, friction materials, brushes and parts of all types.

Resistox Lead Powders also provide performance advantages important to this expanding industry. These powders are available in a complete range of coarse to fine sizes.

May we supply you with more data on these and other Glidden products for your field—Glidden Cuprous Oxide, Cupric Oxide and Cubond (Copper Brazing Paste)? Detailed information gladly sent to you on request.

QUALITY Glidden PRODUCTS

CHEMICALS PIGMENTS METALS

THE GLIDDEN COMPANY

CHEMICALS • PIGMENTS • METALS DIVISION

Baltimore, Md. • Collinsville, Ill. • Oakland, Calif.
Hammond, Ind. • Scranton, Pa.

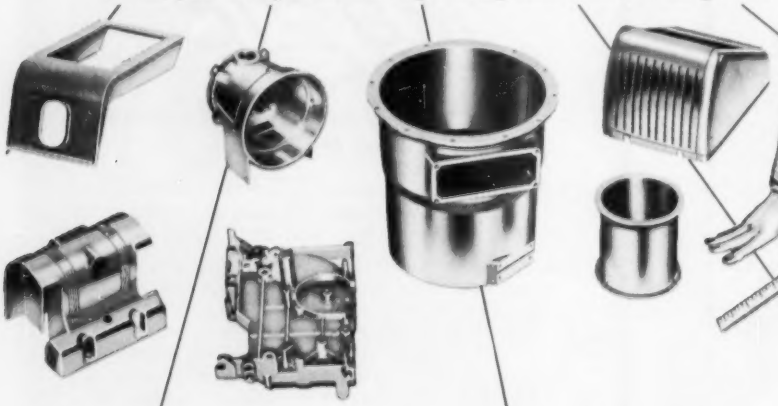
For more information circle No. 30 on the Reader Service Card

Utilize

DOLLIN's Greatly Expanded Die-Casting Facilities to...

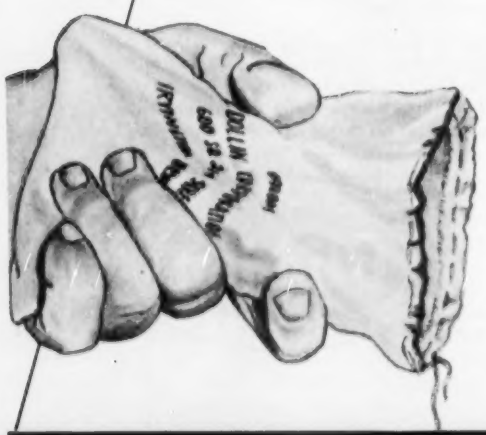
Cut Costs of LARGE Parts . . .

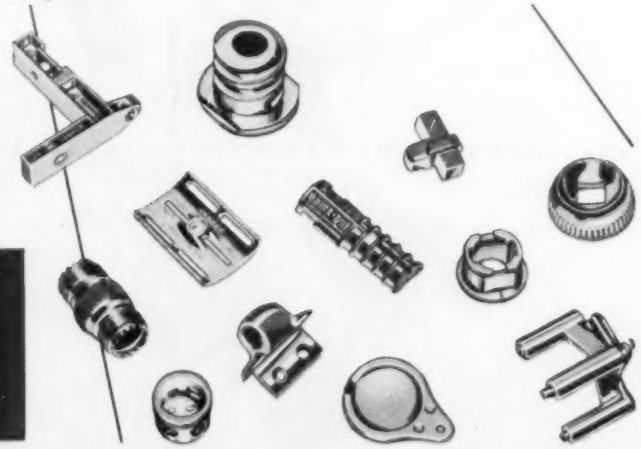
Many leading manufacturers have long depended on our specialized experience and equipment for their zinc and aluminum die-casting needs. Now all departments—aluminum castings, large zinc castings, small zinc castings—have been *doubled* in capacity *and* made more efficient. Let us show you what this can mean to you in piece-costs . . . casting quality . . . deliveries. Send prints or samples for quotation—engineering advice at no obligation.



Cut Costs of SMALL Parts ...

Would you like to buy an *assembly* instead of 2 or 3 separate small parts? Eliminate machining operations? Cut scrap loss? Perhaps you can with *low cost* small zinc die-castings (1000 per lb. to 3 per lb.) made at screw-machine, stamping press speeds on our special *fully-automatic machines*. Send prints or samples for quotation—write for *Small Parts Folder & Samples*.





DOLLIN Zinc & Aluminum DIE-CASTINGS

Dollin Corporation 614 So. 21st St., Irvington 11, N. J.

Sales Offices: Boston • Buffalo • Canton • Charlotte • Chicago • Detroit
Louisville • Philadelphia • Pittsburgh • St. Louis • St. Paul

For more information circle No. 27 on the Reader Service Card

Between the Lines of this and future issues

What's New For Finishing Die Castings . . .?

Finishing and secondary operations on die castings have certain unique features and problems. Many of the standard finishing methods used on other materials require adaptation for use on die cast alloys; other materials are specifically developed for use on die castings. Some of the feature articles we have lined up for the coming months to help with your processing of die castings include: detailed instructions for chromium plating aluminum; a report on the automatic polishing, buffing and plating of auto grille castings; suggestions for more efficient hole drilling; report on an integrated cleaning and plastic coating process; an article about a new process for brazing aluminum die castings; and many others. They will appear in our regular Finishing Section.

Which Beryllium Alloy Where . . .?

Beryllium copper has certain advantages with regard to aging characteristics, fluidity for casting, etc. In the November issue will be an article telling which alloys should be used for which applications. It pertains to investment casting and pressure casting.

Piston Rings Again . . .

Back in February, when PMM first reported on German practice in using powdered iron piston rings in place of cast iron rings, some of our readers doubted our suggestion that this practice might be introduced in this country. Now, more than one piston ring company admits that its work along these lines has reached a production stage. You'll find information about one of these companies in this issue beginning on page 38.

Which School Do You Follow . . .?

Do you belong to the Beef-It-Up School of engineering design? When it comes to designing for adequate strength in any component, do you figure it is necessary to add a lot of metal all over "just to be sure" or do you just put the metal where you need it, and save weight everyplace else? There's a good illustration of the latter philosophy in an article this month on page 35.

Melting Practice for Die Casting Aluminum . . .

A specialist in non-ferrous metallurgy has provided a paper covering some of the common problems encountered in melting and die casting aluminum, and what to do to avoid these problems. It will appear in PMM in November.

Where to use

Luster-on®

Chromate Type Conversion Coatings

Luster-on products meet such Government Specifications as:

OS — 1374
72 — 53
AN — P — 32a
QQ — P — 416
QQ — Z — 325

Luster-on K, 15, 25, 25AB for
Bright, clear, decorative finishes or iridescent and color coatings to meet the toughest corrosion resistance requirements on zinc plate and zinc-base die castings.

Luster-on CD Special for
Brilliant finish and outstanding corrosion protection on cadmium.

Luster-on Khaki Drab and Olive Drab for
Maximum protection with least possible metal removal on zinc plate and zinc-base die castings.

Protective Dip #60
Golden protective finish for magnesium.

Luster-on Cobra
Produces bright lustrous surface on copper and brass. Offers excellent corrosion and tarnishing protection. Eliminates buffing operations. No toxic fumes in this process.

Luster-on finishes, used by many of the country's largest metal finishers, have established themselves over ten years as a dependable, low-cost treatment for thousands of metal items. Data sheets and technical service are available without cost or obligation.

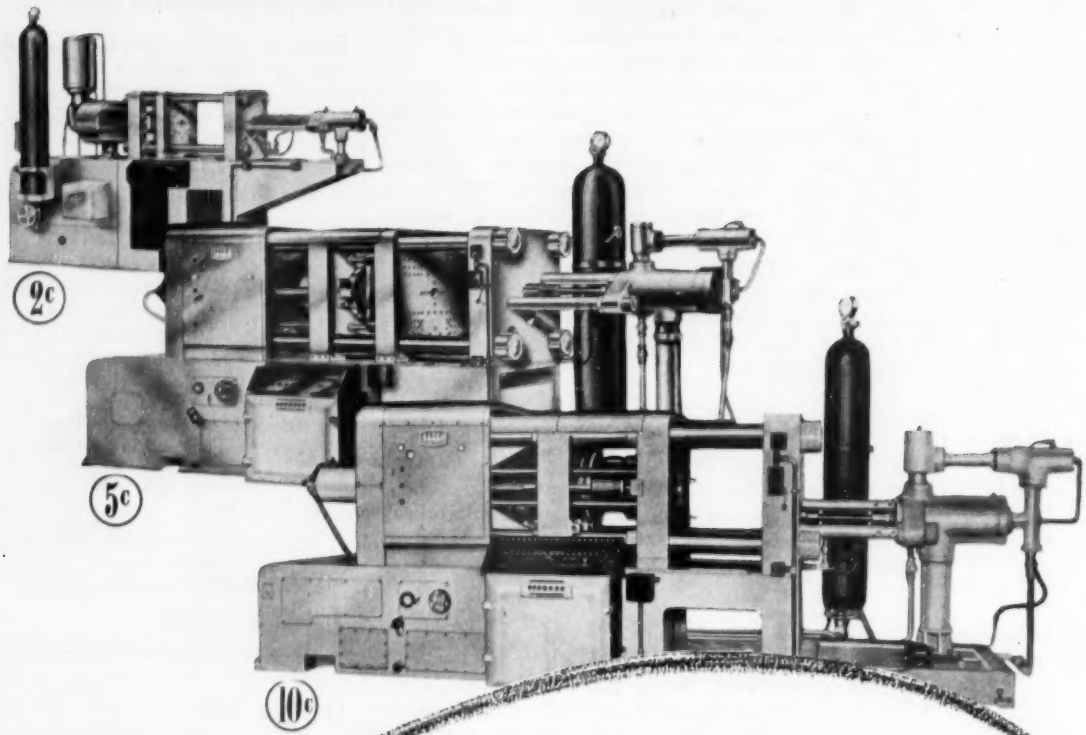
Send Sample Parts for Free Processing to your Specifications

L-12

THE Chemical CORPORATION
[illegible] Waltham Ave., Springfield 9, Mass.

Circle No. 76 on the Reader Service Card

Thousands of Different Castings all with the same 'PECO' PRECISION



Exact mouldings reduce to a minimum the need for machining.

PECO DIE-CASTING MACHINES are proving daily the benefit of their unique ELECTRICAL CONTROL, which covers every movement of the cycle, ensuring continuity and uniformity of production.

The machine has four core-pulling connections, two for each platen, a built-in central hydraulic ejection cylinder and four bumper bars for mechanical ejection.

All these mechanisms are fully interlocked and controlled, permitting operation in any sequence.

By using the central hydraulic ejector as a core-puller the effective die opening may be increased by as much as six inches.

The company has also developed an important new range of HOT CHAMBER die-casting machines, which will be of considerable interest to manufacturers.

PECO PRODUCTS

We will be glad to forward to you on request fully illustrated literature on these machines.

PECO MACHINERY SALES (Westminster) LTD.

28 VICTORIA STREET, LONDON, S.W.I. TELEPHONE ABBey 1793/4/5

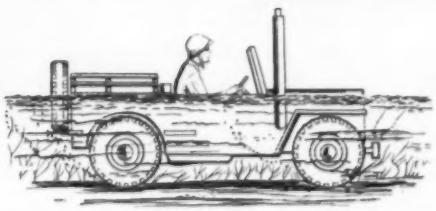
TELEGRAMS: PROFECTUS, SOWEST, LONDON. CABLES: PROFECTUS, LONDON

WORKS: THE PROJECTILE AND ENGINEERING COMPANY LIMITED

For more information circle No. 58 on the Reader Service Card

Here's a watertight case for DIE CASTING ...in this underwater ignition housing

CASE HISTORIES FROM MT. VERNON FILES

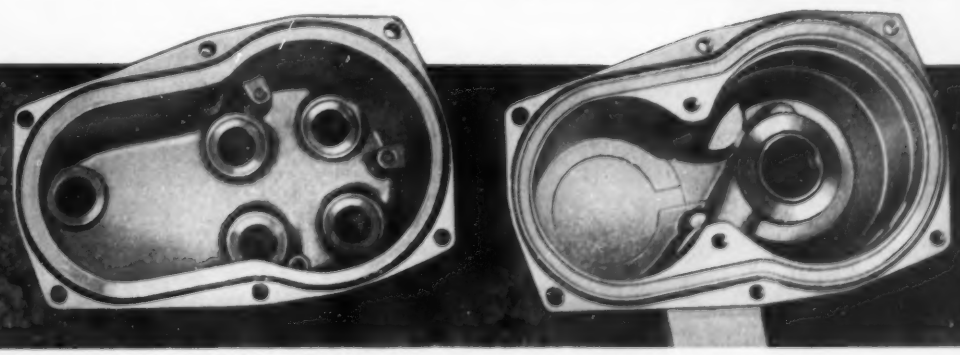


This is a waterproof "Ignitor"—a distributor and ignition coil combined in one case—for a motor vehicle which must operate at times under water. Searching for the *best* way to produce the intricate housing which must keep its contents bone-dry under pressure, the makers, Superior Magneto Corp., Long Island City, N. Y., chose a 2-piece case die cast in aluminum by Mt. Vernon.

Says Superior Magneto: "With die casting we get light weight, with thin walls of great strength and uniform density, able to stand a 300-hour 2½ G. vibration test. With a minimum of machining, dimensional stability is so good the parts are interchangeable, with no need for hand fitting. Both the brass bushings for spark-plug wires and the steel drive-shaft bushing are integrally cast—and they're tight enough to keep out water under pressure. Finally, the finish of the castings is so good, we apply the protective coating directly, without sand blasting or cleaning. All these add up to a fine product, economically made."

Whatever your product, whether simple or intricate, consult with us. We have 162,000 sq. ft. of facilities for die casting aluminum and zinc, and a vast reservoir of experience in die making. Perhaps we can help you, as we helped Superior Magneto, to lower unit costs . . . show you the way to improved products, too.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT



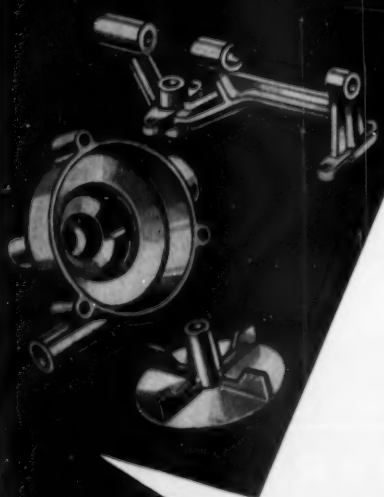
For more information circle No. 51 on the Reader Service Card

BLACKSTONE CORPORATION

Reduces Weight and Cost

with

PARKER DIE CASTINGS



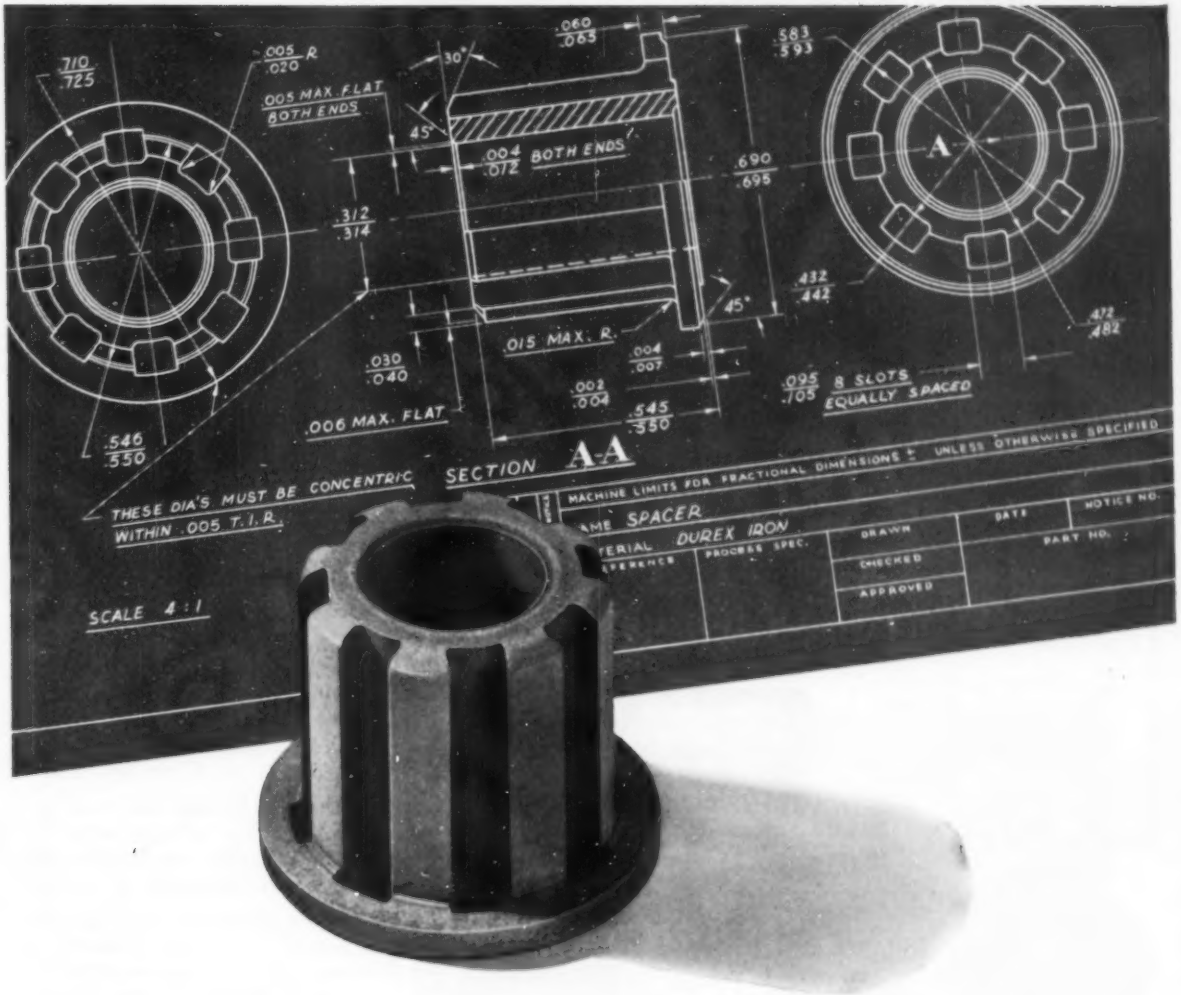
BLACKSTONE'S Full-Automatic Washer with the new flexible cycle is a distinct improvement over previous types. Today's housewife knows new leisure because of Blackstone's advanced engineering and design. For instance, the three parts shown here are Parker Die Castings. Costs are lowered since machining is virtually eliminated. Weight has been reduced without loss of strength. Parker Die Castings are in use in nearly every industry—cast to exacting alloy and design specifications by experienced Parker craftsmen. Call on Parker engineers the next time you need die castings. Each of us will profit.

and when you think of Die Castings THINK OF

Parker White Metal Company • 2153 McKinley Ave., Erie, Pa.

PARKER ALUMINUM *and* ZINC *Die Castings*

For more information circle No. 59 on the Reader Service Card



TRICKY DESIGNS ARE EVERYDAY PROBLEMS FOR MORAINE'S METAL POWDER PROCESS

This part would be a *real* problem to make economically by conventional casting and machining methods. At Moraine it's made from metal powder—easily, in quantity, every day—to precision standards—with important savings in cost!

The background print shows clearly the intricacies and the close tolerances demanded by this part. Yet at Moraine it is produced *completely finished* after *one* press operation. Here's proof of what can be done through close cooperation between Moraine and customer.

The contributions of Moraine's metal powder process to industry are growing day by day. Complex designs like this are being produced by Moraine with great performance-improving, cost-cutting results for many customers.

m

moraine products

DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

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Changes in personnel

Jules F. Halm has retired after 23 years' service with *Allied Products Corp.*

J. W. Marrinan has been elected vice president in charge of operations of *Superior Steel Corp.*

Dr. Harry Walker has been appointed vice president of the *Norma-Hoffman Bearings Corp., Walker Div.*

William E. Grover has been appointed chief erection engineer for *Surface Combustion Corp.*

R. T. Gill has been elected president and member of the board of both *General Supply Co.* and *G. S. Equipment Co.*

Eric O. Prange has been appointed sales representative for Ohio, Michigan and Indiana for *Alexander Saunders & Co.*

Merit Products, Inc. has announced the appointment of three new sales representatives. **Norman Dahley** for the Illinois, Wisconsin territory; *The Herren-Sims Co.* for Ohio and West Virginia; *W. J. Holtmeier Co.* for New York State.

John Lawrence has been named executive vice president of the *Joy Manufacturing Co.*

A. D. Chabot has been appointed manager of the newly created New England Regional Office of the *Detrex Corp.*

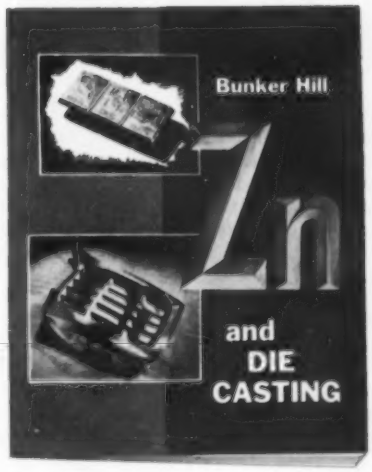
Marlin R. Hemphill has been appointed manager in charge of the Carmet Div., *Allegheny Ludlum Steel Corp.*

Richard R. Senz has been named chief metallurgist at the Buffalo Works of *Aluminum Co. of America.*

I. Wendell Hamm has been appointed director of manufacturing for *The Carborundum Co.*

Continued on page 30

HERE is the story of....



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ZINC
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CHANGES IN PERSONNEL
continued from page 28

The Mine & Smelter Supply Co. of Denver and El Paso and the Todd Machinery Co. of Salt Lake have been named representatives in their territories by the *Hydraulic Press Mfg. Co.*

Alfred Sonntag, manager of Sonntag Scientific Corp., div. of Baldwin-Lima Hamilton Corp. has resigned his position to devote more time to *The Alpha Corp.* of which he is president.

Virgil C. Rice has been appointed as director of manufacturing for the Norge Div. of the *Borg-Warner Corp.*

John Zytell has been promoted to engineering of the Metal Finishing Waste Disposal Dept. of *Frederic B. Stevens, Inc.*

Francis B. Bryant has been named sales representative for Iowa and portions of the adjacent states for *Allied Research Products, Inc.* **Leslie Carlson** has been named chief tool designer for *McCulloch Motors Corp.*

William Ewart has been elected vice president of *Gredag, Inc.*

Jules F. Boand, Jr. has been appointed Pacific coast manager of sales for the *Titanium Metals Corp.*

William J. Fabish has been appointed eastern representative for *Hammond Machinery Builders, Inc.*

Archie F. Wilson has been named director of manufacturing for the *Hydraulic Press Mfg. Co.*

W. D. Morrison has been named assistant to the director of development department of the *Celanese Corp. of America.*

James A. McGowan has been appointed assistant district sales manager for the New York dis-

Continued on page 32

the seven grades of die slick

Here is brief information on the seven different grades of Die Slick—more detailed information will be sent on request.

3 — *Aids parting and ejection on difficult ALUMINUM and MAGNESIUM castings. Non-staining. Enables better metal flow and fill-out of castings.*

4 — *Expressly for BRASS castings—sometimes used on aluminum and magnesium. Extra heavy-duty compound with lubricating graphite. Retains lubricity under high heat.*

9 — *For clean "hardware" finish ZINC castings, where finest plating results are required. Assures maintenance of clean cavities, cores, ejector pins, and guide pins.*

11 — *General purpose compound for ZINC castings. Generally stain-free unless applied too heavily. Prevents sticking and scoring.*

SG — *Standard grade compound for general use on ALL alloys except brass. A high viscosity amber fluid that is not readily burned off by the heat of the dies.*

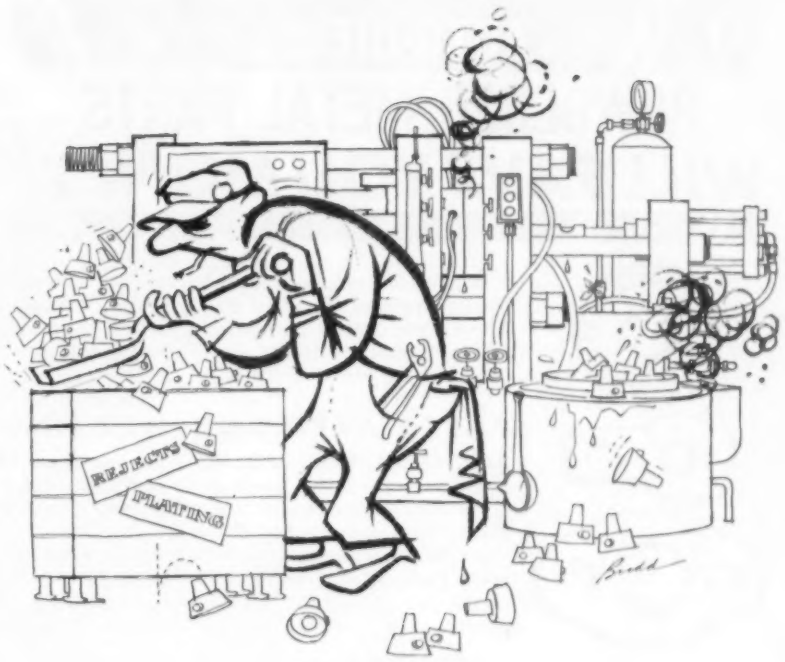
PS — *Plunger-Slick is an adherent viscous compound that will not melt under highest casting temperatures. Expressly for cold chamber machines, it prevents scoring, sticking, or wear on plunger parts. No. 21—(silver) for average use on all alloys. No. 34—(black) has added micronized graphite for extra high lubricity.*

Specify the grade you wish to try—and the alloy on which you will use it. If you're not fully satisfied, simply return the unpaid invoice.

Cordially,

V. W. Smith

V. W. Smith



"This does it.. either I get Die Slick or a bigger shovel"

. . porosity . . surface stains . . bad fill-out . . pick any of the many causes of rejected castings, and we'll bet that Die Slick or Plunger-Slick can help improve the situation. There are seven distinct grades for all casting requirements whether in lead, zinc, aluminum, magnesium, or brass.

Die Slick and Plunger-Slick are the standard die casting compounds now in use by over 80% of all die casters. With acceptance like this to back a product, it seems just plain foolish not to investigate if you are not now using them in your operation. Condensed information on the seven grades is given in the adjacent column. We will be glad to send you a gallon of the proper grade of Die Slick or Plunger-Slick for production trial in your own plant. And furthermore, if you are not satisfied with the results, we will cancel the invoice.

DIE SLICK®

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WILL SAVE YOU MONEY!

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CHANGES IN PERSONNEL
continued from page 30

trict and **William F. Couter** has been named assistant product manager for sand and permanent mold castings for the *Aluminum Co. of America.*

An announcement from *Rem-Cru Titanium, Inc.* gives three new appointments. **Walter E. Greff** becomes vice president and assistant general manager; **Dr. Walter L. Finlay,** vice president and manager of research; and **John M. Dempsey,** assistant secretary.

Paul W. Moehle has been appointed west central region manager for the *Detrex Corp.*

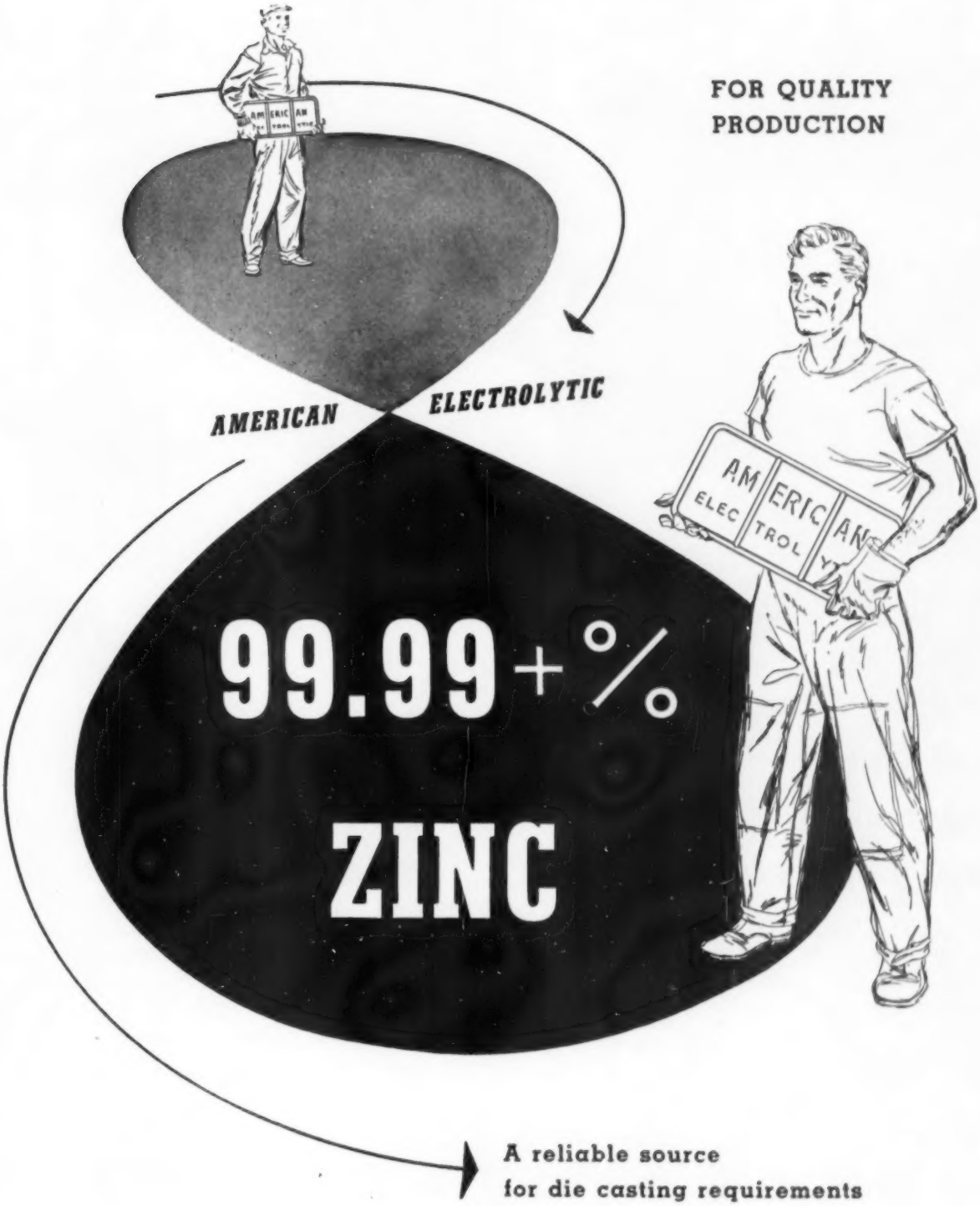
Jack C. H. Stearns has been appointed to an executive position with *Dow Export Co., Dow Chemical International Ltd.,* and *Dow Chemical Inter-American Ltd.*

Three new sales representatives have been appointed by *Merit Products, Inc.* **Norman Dahley** for Wisconsin and Illinois, **The Herren-Sims Co.** for Ohio and West Virginia, and **W. J. Holtmeier Co.** for New York state.

O. T. Thompson has been appointed assistant branch mgr. of the Detroit territory of *The Carpenter Steel Co.* Other appointments by the company are: **Douglas R. Beggs** formerly director of personnel is now assistant to the vice president — production and **Harold W. Miller,** formerly assistant general superintendent is now chief plant engineer.

B. J. Riggs has been appointed general traffic manager by the *Behr-Manning Corp.* of Troy, N. Y., to succeed **Harry N. VanAntwerp,** who is retiring after 41 years service with the corporation.

John Cook, grinding department foreman, has retired after 43 years with the *Norton Company,* Worcester, Mass. He is a writer of many articles on grinding and has previously been salesman, demonstrator and district manager in the company. **Stewart O. Bailey** succeeds Mr. Cook.



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Such patronage must be deserved

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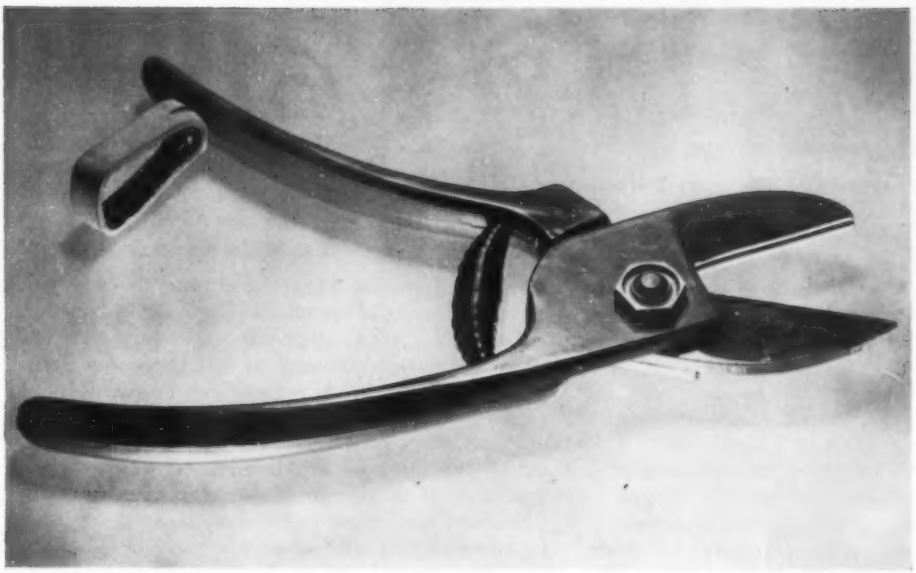


1. DIE CAST ZINC gives a pair of smooth, strong, light handles for these pruning shears. They replace old fashioned cast iron.

Where Strength Is Needed Die Castings Can Be Used

There are two schools of thought on designing for stressed applications. Which school do you belong to? The design of these shears is a good example of up-to-date thinking.

TWO alternative approaches in designing a stressed component may be described as a "give-it-the-works" or a "set-a-safety-factor" attitude.

In the first of these, the piece being designed is beefed up all over on general principles, regardless of the locality in which the stress is applied, and a material selected which could not be broken under the most abnormal service conditions.

The second, and more realistic approach, includes setting a reasonable safety factor above normal expected service requirements, and then choosing a material and designing sections adequate to do that job.

The second approach invariably gives a cleaner, lighter weight and less expensive part that will nearly always do a better job. There is no benefit from the "guestimation" method of engineering, and there are many disadvantages, whether the component under consideration is a machine part or a simple consumer item.

Impressive examples of the more modern attitude are seen in pruning and lawn shears manufactured by True Temper Corp.

Design Factors That Must Be Considered. See next page

Die Castings Make Better Handles Than Cast Iron Or Sheet Steel . . . Cont.

For pruning shears . . . zinc die castings

Think back a few years to the best available pruning shears. They were usually heavy cast iron affairs. The handles were never designed to fit a human hand, the finish was generally paint over a rough surface and if one carried a pair of them in a hip pocket for very long, the pocket was usually torn. Few, if any, women could handle these shears for more than very occasional snipping of light twigs.

Now look at a modern pair of pruning shears such as these being made by True Temper, Figure 1. The handles are die cast in zinc by Precision Castings Co. They are carefully shaped to fit most comfortably in the hand and section thicknesses have been designed to give adequate strength, without the use of excess metal, for the presumed stresses that might be set up during use.

Careful design has shown that two blades operating like a pair of scissors will not cut as well in pruning as a single blade working against an anvil and for best results the anvil is of softer material than the blade.

Many other factors favor the use of die castings for this shear. First, of course, is that the weight is drastically reduced. The blade holding insets and locking devices can be cast as integral parts of the handle member. Lugs to hold the spring are easily cast on as is the boss for the leather thong.

The pivot hole is cored to size so that no additional machining is required. Finally, the surface finishing is reduced to light sanding to remove the parting line burr which might remain after trimming and then painting with a baked enamel.

The net result of good designing, combined with die castings, has been, then, a pruning shear that is light in weight, cuts easily, can be used readily by a woman, and can be produced at a lower cost than a comparable shear made by any other process.

For grass shears . . . aluminum die castings

In most cases, trimming around the edges of lawns is a hand operation. The user insists that the grass shears cut closely and easily and that the handles fit his hand so that there is a minimum of fatigue. A further requirement is, of course, light weight.

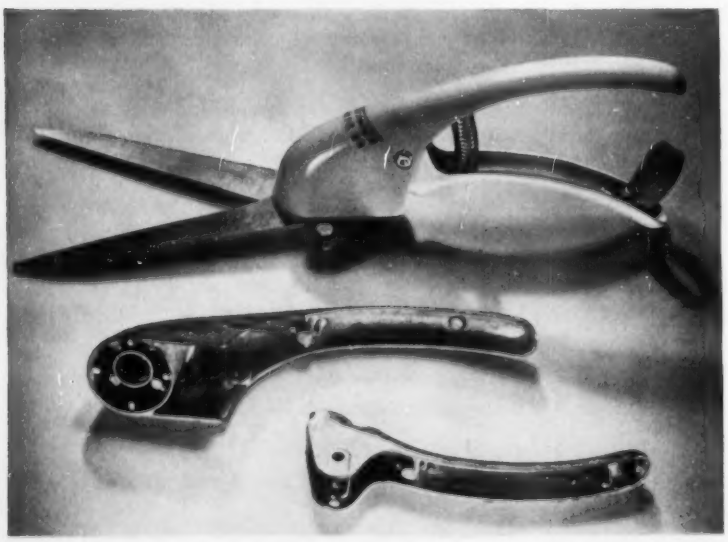
Secondary considerations which the manufacturer must make are freedom from corrosion, good paint adherence to preserve a smooth surface and the lowest possible manufacturing costs commensurate with quality.

Light weight and proper contour of the handles were the main consideration when True Temper set out to redesign their grass shear. The most desirable handle shape was designed and the material specified was aluminum.

At this stage, the design had to be fitted to a manufacturing method. It became evident at once that if a pair of aluminum handles of the design worked out was to be made, only die casting would be the method of producing them.

From the illustration, Figure 2, it is evident why the most desirable design has to be a die casting. The two bosses to hold the spring can be cast integrally as can the retainer for the thong. Pivot holes can be cored and the head

Continued on page 90



2. BETTER THAN STAMPINGS are these two aluminum die cast handles for grass shears. The shape is better, they are lighter, and they do not rust.

BLACK ANODIZED aluminum permanent mold castings have solved a problem of surface reflections that interfered with best visibility for this instrument.

Instrument Redesigned For Better Visibility

LIQUID level indicators in boiler rooms are important safety devices, but too frequently these water gages are, by necessity, located in positions far above the boiler room floor, often in the darkest part of the room where visibility is poor. Gage readings, under these conditions, are, at best, approximate.

To overcome this difficulty, Yarnall-Waring Company of Philadelphia redesigned their remote liquid level indicators to provide maximum visibility under all conditions. In the process of developing an improved instrument, it was found that an aluminum permanent mold casting had definite advantages over sand castings previously used for the instrument's front panel.

Improved visibility. To provide easier reading under adverse conditions, the company widened the visible area and raised the dial face above the instrument housing so that it can be seen clearly from the sides, as well as from the front. The dial face is illuminated and calibrations are strongly contrasting for legibility. High and low ends of the dial are unmistakably labeled with red blocks.

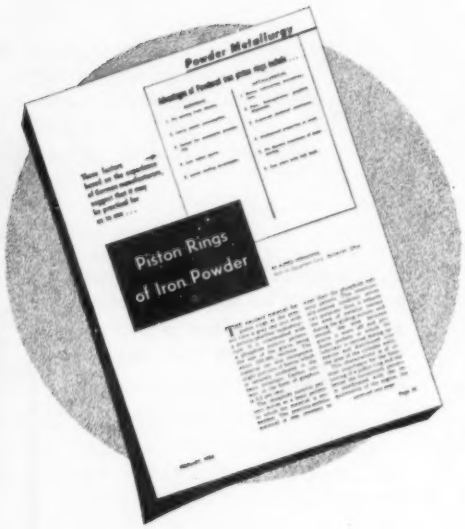
Improved front panel. It was felt that a smoother, better-looking front panel should replace the sand casting previously used. Part of this is for better sales appearance, and part for improved function. For example, the rough sand casting used on previous models was finished with a crackle type enamel in order to mask the surface roughness characteristic of sand castings. This glossy, reflective paint gives off confusing highlights that were found to be undesirable on an instrument face.

By changing to a smooth-surfaced permanent mold casting that could be treated with a black anodized finish, a uniform, non-reflective instrument face now surrounds the illuminated dial. When needed, the anodized

Continued on page 76

PMM First Reported On Powdered Iron Piston Rings

In February 1954, PMM described German use of powdered iron piston rings...

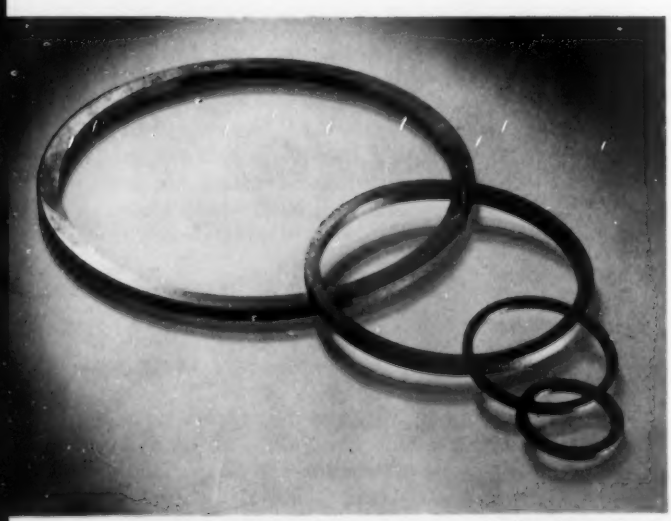


As American Manufacturers Get Into Production, Here Is

A Progress Report On Powdered Iron

By **PHILIP R. KALISCHER**
Associate Editor

IN their efforts to reduce frictional losses in internal combustion engines, design engineers have steadily decreased the section thickness of the piston rings. Where a few years ago the average ring had a section thickness of about ¼ inch, today that has been reduced to 3/32 inch.



Muskegon Piston Ring Co.

To produce such thin rings by casting methods has become increasingly difficult:

- Melting practices have had to be changed, since minor impurities picked up in the cupola have become increasingly difficult to live with.
- Sand inclusions from the molds, which formerly could be removed by grinding, now require complete scrapping of the ring.
- Effects of impurities picked up from the air, oxides, etc., have increased scrap losses.
- Inability to control precisely the pouring temper and cooling rates has brought up a problem of warpage of the castings that cannot be corrected during machining operations.

Obviously a new material from which rings could be made had to be found. Some of the manufacturers have eyed steel (many of the oil control rings are now being made of steel); others have turned to powder metallurgy.

From the aspect of shape, few pieces can be selected which lend themselves more readily to powder metallurgy techniques than a piston ring. Actual surface area being pressed is small, even on a large ring and the ratio of thickness to diameter is highly favorable. Securing uniform section density, then, does not pose a difficult problem, nor does adequate press capacity cause trouble because of the relatively small section under pressure.

Most difficult was the problem of securing

Piston Rings

uniform and duplicable graphite distribution through the ring, and the production of adequate strength and elasticity.

Under normal methods of producing powdered iron parts, tensile strengths in the order of 30,000 psi are produced with substantially no elasticity and relatively poor creep properties at elevated temperatures. Such properties are completely unsuited for piston ring applications, making necessary entirely new techniques and even new concepts.

Of equal importance was the question of economics; the new ring had to be as cheap as a cast iron ring (and preferably cheaper), but above all, it had to be cheaper than a steel ring if it is to compete.

A recent interview with Harold G. Vaughan, president of Muskegon Piston Ring Co. brings to light many interesting features about the rings that his company has developed.

While it is true that some 2½ million rings have been made, most of them have been for applications such as the sealing rings on automotive type automatic transmissions and small compressors. These rings operate under much less severe conditions than do the compression and fire control rings of an internal combustion engine. This factor is important, that all of the powdered iron rings that are now in operation on other than a test basis are sealing rings for transmissions and compressors.

Properties

What are the properties of the ring material that has been developed thus far?

Structurally, the material is a pearlitic iron

Continued on page 77

POWDER METALLURGY

What This Piston Ring Development Means To The Designer...

The broader design implications of this piston ring development work, from the design engineer's point of view include:

....application of an iron part to service under severe stresses at elevated temperatures,

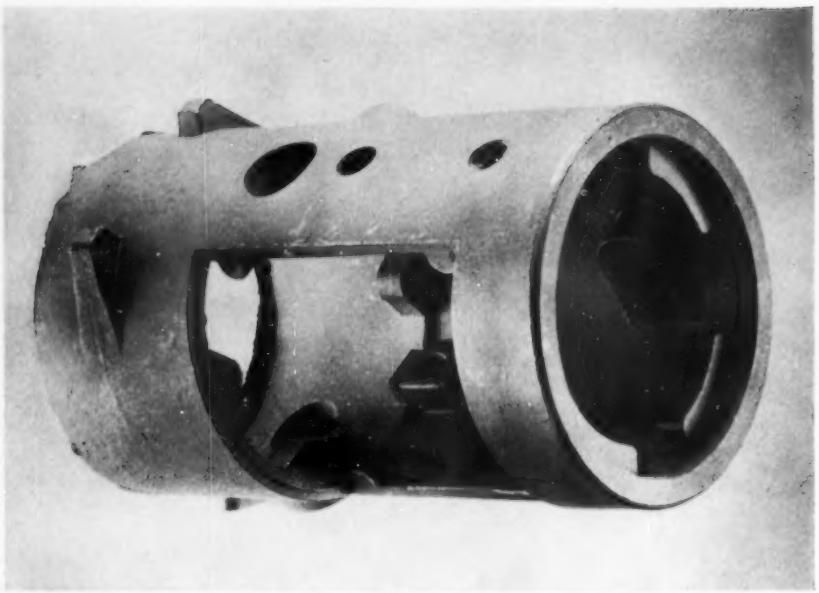
....development of a material from iron powder having relatively high tensile strength and moderate hardness, without use of infiltration,

....development of a material from iron powder that is highly resistant to wear, abrasion and galling without depending upon maintenance of an oil film more than is normally supplied to cylinder walls,

....demonstration of the ability of powder metallurgy to develop specific materials for a given application where the probable amount of material to be used is adequate to warrant such development work,

....further demonstration of the tendency to convert from cast iron to powder metallurgy where a considerable amount of machining is required on the casting.

Key to the economy of complex mold expenditure is . .



1. THIS "ROUGH" CASTING has most dimensions cast to .005 tolerance.

How Much Can We Save On

PRECISION is a relative term. In some industries it may mean holding a dimension to within 1/64 while in others it means holding to within 0.0001 or less. Regardless of the meaning, it is uniformly true that, as the allowable tolerances decrease, the cost of machining will increase. It is not surprising, therefore, that those industries that must maintain the closest tolerances are turning, in ever greater numbers, to investment casting as a source of "rough" parts.

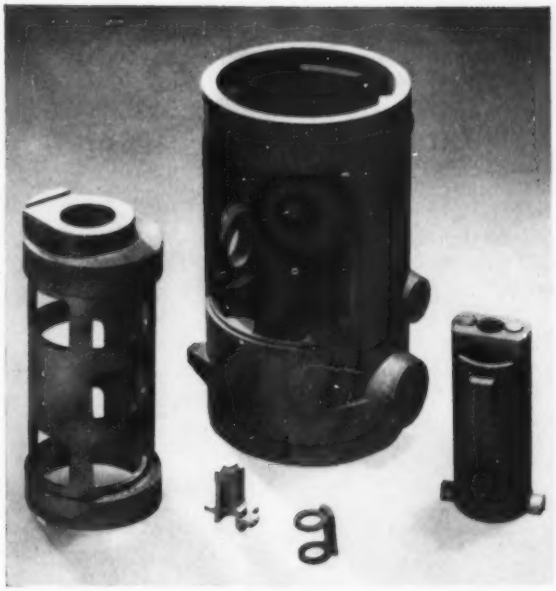
The Farrand Optical Co., Inc. of New York is no exception to this generalization. To this company, an investment casting on which every dimension has been held to a tolerance of 0.005, is indeed rough since many of the fully machined parts made from these castings have dimensional accuracy in the order of 0.0001 - 0.0000.

While it makes little difference in machining costs whether 0.005 or 0.002 of metal must be removed, in fact the larger amount is preferable, it makes a vast difference in machining costs if, say, 1/64 must be removed. Basically, then, this is the reason for using investment castings.

In many cases, another factor enters into the considerations. This is the ultimate complexity of the part. Investment casting is unique among the casting processes for its ability to produce parts of extreme complexity. This factor, which sets the process apart from all others, comes about largely for two reasons.

- The pattern, in either wax or plastic, is sufficiently rigid so that separate slides and cores can be pulled without disturbing the accuracy of the pattern.
- Almost any pattern can be used, provided it can be coated with very finely divided investment material and also provided that, when the pattern is invested and heated, the molten wax or plastic will run out cleanly and not leave inclusions which would destroy the contour of the metal part to be cast.

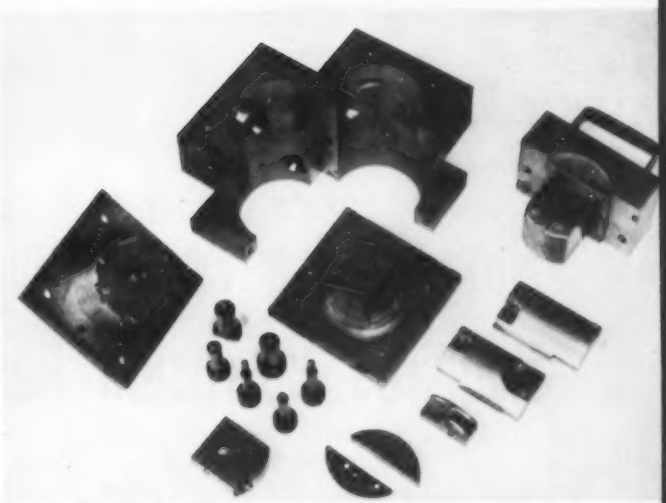
How well an investment casting solves the problems of reduction of excess metal and high permissible complexity is evident in the housing casting shown in Figure 1. This is a general view of the housing as cast in either type 303 or 416 stainless steel by the Witkin Precision Casting Co. The numerous lugs, bosses, etc. that are cast in are clearly evident. What is not



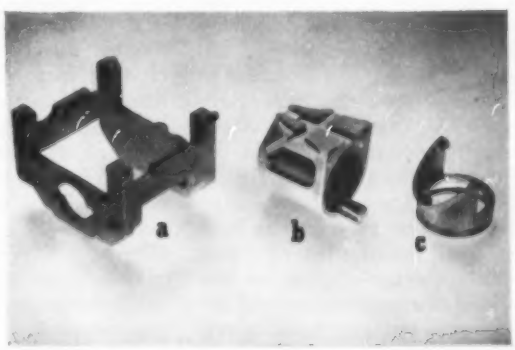
2. COMPLEX FORMS dictate use of ingenious molds.

Machining?

22-piece mold is justified to produce one casting



3. MULTIPLE-PIECE MOLD makes patterns, and yet cuts the cost of finished pieces.



4. CHOICE OF ALLOYS is permitted by investment casting, as illustrated by these castings in aluminum and silicon bronze.

evident in this view is that every dimension on the housing is held to a tolerance of 0.005 or less so that the amount of excess metal to be removed in machining is held to a minimum and yet is adequate to permit the slight corrections that may be needed due to misalignment.

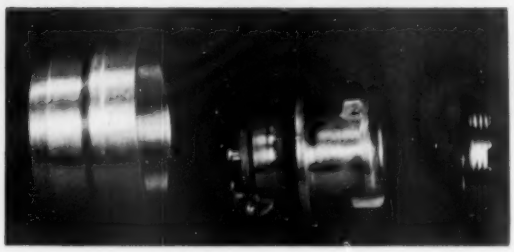
That investment casting can make parts that are impossible to fabricate by other methods is well known. What is not as well known is the complexity of the molds required to make the wax patterns for a piece such as this housing. The component parts of the mold are shown in Figure 2 and 3.

The fact that 22 separate parts are required for this mold is indicative of the flexibility that is possible because the pattern is sufficiently rigid to hold its shape when removable cores and slides are employed.

Of course, tooling of this sort is expensive and must be justified by an ultimate cost reduction in the part. As a first approximation in determining whether the investment casting process is justifiable, Farrand Optical Co., Inc. uses a general rule that the cost of tooling for the casting should not exceed the cost of tooling for any other method of fabrication to bring the

Continued on page 89

OF FOUR PROCESSES considered for making the two main components of this new product, die casting proved to be the most economical. The Hy-Tap unit shown at the left helps in tapping beer kegs that are made of aluminum or stainless steel.



New Device For Tapping Beer Kegs Requires Corrosion Resistance

THE old methods of tapping beer kegs have been improved. The thirsty patron of the keg was probably not aware that there was a problem connected with this pleasant event, but beer companies and vendors of beer know well the unsanitary conditions, the loss of beer through evaporation, and the difficulty of cleaning entailed in old-fashioned methods.

Now, a new product has been developed, making use of a pair of aluminum die castings, to give modern efficiency to an old occupation — tapping the beer keg.

Designed and manufactured by Co-Op Engineering Co. of Big Rapids, Mich., and sold by Hygienic Products Corp., the device is called the "Hy-Tap" developed for stainless steel and aluminum beer barrels.

Two components are die cast in Apex No. 39 alloy by Nelson Metal Products. These pieces are the center post and outside ring.

The designers considered several possible methods for producing these components: machining from bar stock, aluminum sand castings and forgings, but found that the aluminum die castings are the most suitable for a completed product and also, the most economical.

Exposed To Corrosive Action

Durability is one of the most critical considerations in designing this unit. It is not only subject to much abuse requiring resistance to shock and other stresses, but more urgent, it must also have resistance to salts, acids and strong caustics over prolonged periods of time. To further lengthen the natural corrosion resistance of the aluminum alloy, the pieces are anodized before assembly.

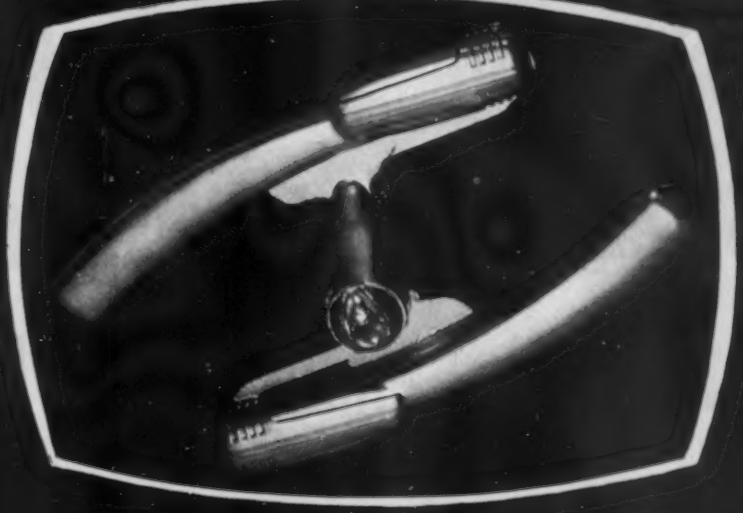
With regard to shape, the center post is the more complex of the two die castings. A pair of cammed locking lugs are included at the lower end, and several other details which would be expensive to form by screw machine, are cast integrally. Seat for a sealing ring and provisions for hinging the spring-actuated closure are formed in the casting.

Very little machining or secondary processing is required after the die cast parts are received from the vendor. Less machining and handling is needed than would be possible with any other type of components.

It can be said that die castings have here helped to make possible a specialized type of new product at lower cost.

For more information circle No. 3 on the Reader Service Card →

telling the story of 'dag' dispersions



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Jobbing Die Casters Work On Standards, Materials, Promotion At 26th Annual ADCI Meeting

THE MEETINGS The commercial die casting companies who comprise the American Die Casting Institute put in two days of intense work on a variety of business and technical problems when they convened for their 26th annual meetings in Chicago September 15-16.

The largest attendance on record participated in serious deliberations which encompassed matters as diverse as industry standards and new promotional activities.

Tribute was paid to two retiring members of the Institute: G. M. Rollason of Aluminum Company of America and J. M. Davis of Union Die Casting Co., Ltd., both active in Institute affairs for many years. Mr. Rollason, whose retirement from Alcoa was recently announced, was president of the Institute during 1954; Mr. Davis was one of the founders of the Pacific Coast Regional Group within the Institute and was a director of the organization.

Activities of the four regional groups that make up the Institute, as reported by David Laine, Institute secretary, show a total of 31 meetings during the past year, at which 71 job shop members were represented by 1250 individual representatives.

NEW OFFICERS Officers elected for the coming term are headed by William J. During of Precision Castings Co., Inc., president. Serving with him will be: George Rawls of Pressure Castings, Inc., vice president; David Laine, secretary; and W. J. Parker, treasurer.

Board of directors of the Institute during the 1955 term include: *Eastern Regional Group*—W. J. During of Precision Castings Co., Inc.; C. J. Sheehan of Aluminum Company of America; W. G. Newton, Jr., of Newton-New Haven Co.

Central Regional Group—R. A. Luedtke of Schultz Die Casting Co.; H. H. Weiss of Superior Die Casting Co.; George Ralls of Pressure Castings, Inc.

Midwest Regional Group—H. F. Schroeder of Milwaukee Die Casting Co.; Walter Brown of Kiowa Corp.; C. W. Omann of Advance Tool & Die Casting Co.

Pacific Coast Regional Group—A. W. Simpson III, of Western Die Casting Co.; J. C. Bennett of Anderson Die Casting & Engr. Corp.; R. R. Dreibus of Harvill Corp.

Directors-at-Large—E. L. Anderson of Globe-Imperial Corp.; F. J. Koegler of Doehler-Jarvis Div., National Lead Co.; L. G. Vanderhoof of Stewart Die Casting Div., Stewart-Warner Corp.; C. L. Anthony of The Hoover Co.

Ex-Officio — A. T. Lillegren of Madison-Kipp Corp.

TECHNICAL WORK Two phases of technical activity occupied the group . . . those of the several Institute Committees working on such matters as product standards and the Certified Zinc Alloy Plan . . . and those of the Die Casting Research Foundation set up a year ago to carry out certain fundamental research to improve materials and practices used in die casting.

Reporting for the Institute Metallurgical Committee, A. E. Weiss of Superior Die Casting Co. told of progress made during the past year in extending recognition for and acceptance of the Certified Zinc Alloy Plan. He also discussed the new American Gas Association listing of requirements for gas valves giving satisfactory test procedures to permit use of aluminum die castings for such valves.

NEW ADCI PRESIDENT . . .
. . . W. J. DURING

In the vital field of product standards, the group reviewed the results of a year's preliminary work developing such standards. The first of these offered for membership discussion was that dealing with linear dimensional tolerances.

In the Research Foundation session Thursday afternoon, progress on projects concerning die casting die materials and high temperature die lubricants was reported. Validation of laboratory techniques for screening die materials has been verified by field tests, and offers an important advancement in the study of die materials.

DOEHLER AWARD Walter M. Goldhamer, vice president of Superior Die Casting Co., was presented with the annual Doehler Award for the outstanding contribution to the die casting industry.

Mr. Goldhamer, chairman of the Central Regional Group of the Institute, was honored for a number of contributions, most recent of which was his initial proposal and work to found the Die Casting Research Foundation. He was also credited with many accomplishments as industry representative during World War II and the Korean conflict, helping with liaison between the industry and Washington bureaus.

FIRE RESISTANT FLUIDS A four-member panel offered a comprehensive discussion of fire resistant hydraulic fluids for use in die casting machines in one of the open sessions.

On the subject of water-base fluids, W. H. Millett of Carbide & Carbon Chemical Co., and C. R. Schmitt of E. F. Houghton & Co. made the presentation, while John S. Harris of Monsanto Chemical Co. and W. C. Goodwine of Celanese Corp. of America discussed non-aqueous base fluids.

Papers covered properties and characteristics of materials, effect on packings and hose, service life, costs, etc.

PROMOTIONAL ACTIVITIES One of the highlights of the sessions was a preview of a new movie prepared and made available to industry by the American Zinc Institute. How this film will be offered to industry groups and the part to be taken by Die Casting Institute members in stimulating interest in the new film was the subject of a panel discussion.

The movie, a 16mm film in color, is a dramatic representation of the die casting method, emphasizing the advantages of this process for the designer. A large number of representative die castings are included.

A new publicity committee also reported a plan for disseminating more information about the die casting process, the ADCI, and the advantages of the die casting job shop through magazines, newspapers and other media of communication.

NEW MEMBERS Several new member companies were introduced into the organization. They are: Oswego Castings Corp. of Oswego, N.Y.; Ability Die Casting Co. of Chicago; Lloyd Products, Inc., of St. Paul, Minn.; Cincinnati Die Casting Co. of Cincinnati, Ohio; Springfield Die Casting Co. of Kenilworth, N.J.; Peerless Aluminum Foundry of Bridgeport, Conn.; and Ambrit Industries, Inc., of Glendale, Cal.

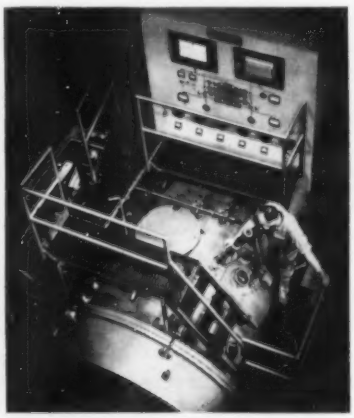
1000-Pound Vacuum Furnace Melts Tough Alloys For Jets

A 1000-pound capacity vacuum furnace — largest ever constructed for melting and centrifugally casting high-temperature alloys; designed and built by F. J. Stokes Machine Co., — has just been installed at Utica Drop Forge & Tool Corp., Utica, N. Y.

Utica will use the new furnace to make high-purity alloys of superior heat-resisting properties for use in turbine blades and discs of advanced jet engines. Vacuum processing will give these alloys, such as Pratt & Whitney Aircraft's just-announced "Waspaloy," even greater tensile and stress-rupture strength than conventional atmospheric-processed material.

For example, tests by Utica and Pratt & Whitney metallurgists have shown that vacuum melting increases the stress-rupture life of turbine blades 2½ times over conventional arc-melted blade material. Engineers at Pratt & Whitney believe that vacuum-melted "Waspaloy" possesses greater heat-resisting qualities at the jet engine's operating temperatures of 1500 to 1600 deg. F. than any other wrought alloy known.

The improved properties of these high-purity metals will allow jet engines to operate at higher turbine temperatures for longer periods of time than was possible with previous blade materials. This not only enables the engines to deliver more thrust



and boosts the speed of the planes they power, but it also increases the service-life of the critical turbine components of the engines, lengthens the interval between engine overhauls, and cuts down the cost for replacements.

(An idea of the severe stresses to which turbine blade materials are subjected can be grasped from the fact that when the turbine is revolving at full speed, each blade is being pulled outward by a force equal to about 25,000 times its own weight. This is roughly the equivalent of hanging eight average-sized automobiles from the tip of each blade. And this load must be borne at temperatures in the vicinity of 1500 degrees, where metals lose much of the strength they possessed at lower temperatures.)

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Patents, Trademarks And Copyrights

By GEORGE V. WOODLING

THE FOUNTAIN of industrial wealth is found in the flow of ideas which must be protected and made practical by patents, trademarks and copyrights. Even our natural resources would be of little value without the help of inventions.

Patents, trademarks and copyrights cover separate and well-defined areas of legal protection, but the differences between these three types of legal protection are not always clearly understood.

Illustrating the Difference

A person shopping for a new car usually collects all available advertising literature presenting photographic illustrations, artistic sketches and text material describing the appealing features of the respective makes of car. The printed text and illustrations on each piece of such literature — circular, pamphlet or catalogue—are the subject matter of a copyright and, to be registrable in the Copyright Office, these "writings" must have printed thereon a proper copyright notice, such as "Copyright (year) by (name of car manufacturer)."

When the prospective purchaser decides upon the make of car he wants to buy, the name of that care becomes important to him. That name is the subject matter of a trademark and is likewise very important to the manufacturer. The protection for such a trademark is obtained by registering the same in the United States Patent Office. Contrary to popular belief, a trademark can never be protected by a copyright registration, nor can copyrightable material be protected by a trademark registration.

The new car owner will, of course have checked into the new and special mechanical features described in the advertising literature for each make of car. These are the subject matter for patents. Briefly, patentable subject matter includes new and useful products, ma-

Continued next page

Distinction Between Patents, Trademarks and Copyrights

	Patents	Trademarks	Copyrights
Subject Matter	Process, machine, manufacture, or composition of matter, plant and design*	Word, name, symbol or combinations thereof indicating origin of manufacture and sale	Books, paintings, photographs, sculpture, charts, drawings and commercial prints and labels.
Rights Granted	To exclude others manufacturing, using and selling devices embodying patented inventions	To keep others from using mark on similar goods which might confuse the public (prevent others from unfairly competing with similar mark)	To bar others from copying (Copyright means right to copy, but gives no right to ideas expressed in work)
Who May Obtain	Any inventor (adult, minor, citizen, alien, and any natural person; dead or insane inventor by representative)	"User" of the mark; only person or company who has actually adopted and used the mark on goods in commerce	"Author" of the material; may be an individual or corporation (Owner of the right)
Term	17 yrs. not renewable*	20 yrs., renewable from term to term as long as mark is used; affidavit of continued use after five years	28 yrs.; renewable for 28 yrs. more—total of 56 yrs.
Where to Apply for Document	Patent Office — Commissioner of Patents Letters Patent	Patent Office—Commissioner of Patents (Trademark Div.) Trademark Registration Certificate	Library of Congress—Register of Copyrights Copyright Registration Certificate
Fees	Filing: $30.00 Final: $30.00 Design Patients*	$25.00	$4.00—except for prints and labels. This fee is $6.00

*Design patents cover only appearance or outside effect and differ from other patents in that they are issued, at the option of the inventor, for terms of 3½, 7 or 14 years, with corresponding fees of $10, $15 and $30.

Patents — cont.

chines, compositions of matter, processes, or any new and useful improvement thereof.

Definitions

The following definitions of the three types of legal protection of ideas point the distinguishing characteristics of each:

A patent is a printed document issued by the U. S. Patent Office which gives an inventor the right to exclude others from manufacturing, selling and using the patented invention for 17 years — the life of a patent. Patents are not renewable, but patents for improvement inventions may be obtained.

A trademark is a mark, picture or printed word or words (sometimes referred to as the commercial signature) applied to goods of a manufacturer or seller so that the public can distinguish the goods which are manufactured and sold by such manufacturer or seller from similar goods manufactured and sold by someone else. A trademark registration is issued by the U. S. Patent Office for a term of 20 years and is renewable repeatedly for like periods of 20 years as long as the trademark is continuously used.

A copyright gives the copyright owner the exclusive right to produce or reproduce his literary or artistic work. It prevents others from copying the literary or artistic works of the copyright owner. A copyright certificate of registration is issued by the Library of Congress (Register of Copyrights) for a term of 28 years and is renewable for another period of 28 years, making a total of 56 years.

An outline showing the distinctions between patents, trademarks and copyrights in detail appears on page 47.

Trademarks and Patents: Up to the present time the U. S. Patent Office has issued over 589,000 registrations for trademarks. This number is greater than the number of words defined in Webster's Unabridged Dictionary.

Property in a trademark should not be confused with property in a patent. A company may develop a new device and obtain a patent to protect the unlawful appropriation on the construction of the device, and at the same time may designate the new device by a trademark and obtain a registration to protect the device from being unlawfully sold by others under the same trademark. The trademark indicates the origin of the goods and does not give any exclusive property right in the article to which the trademark is attached, nor in any invention residing in the article. The right to exclude others from manufacturing, selling and using a device can be obtained only by complying with the patent laws.

For the Progress of Science

The purpose of the patent laws is not primarily to reward the inventor, but to promote the

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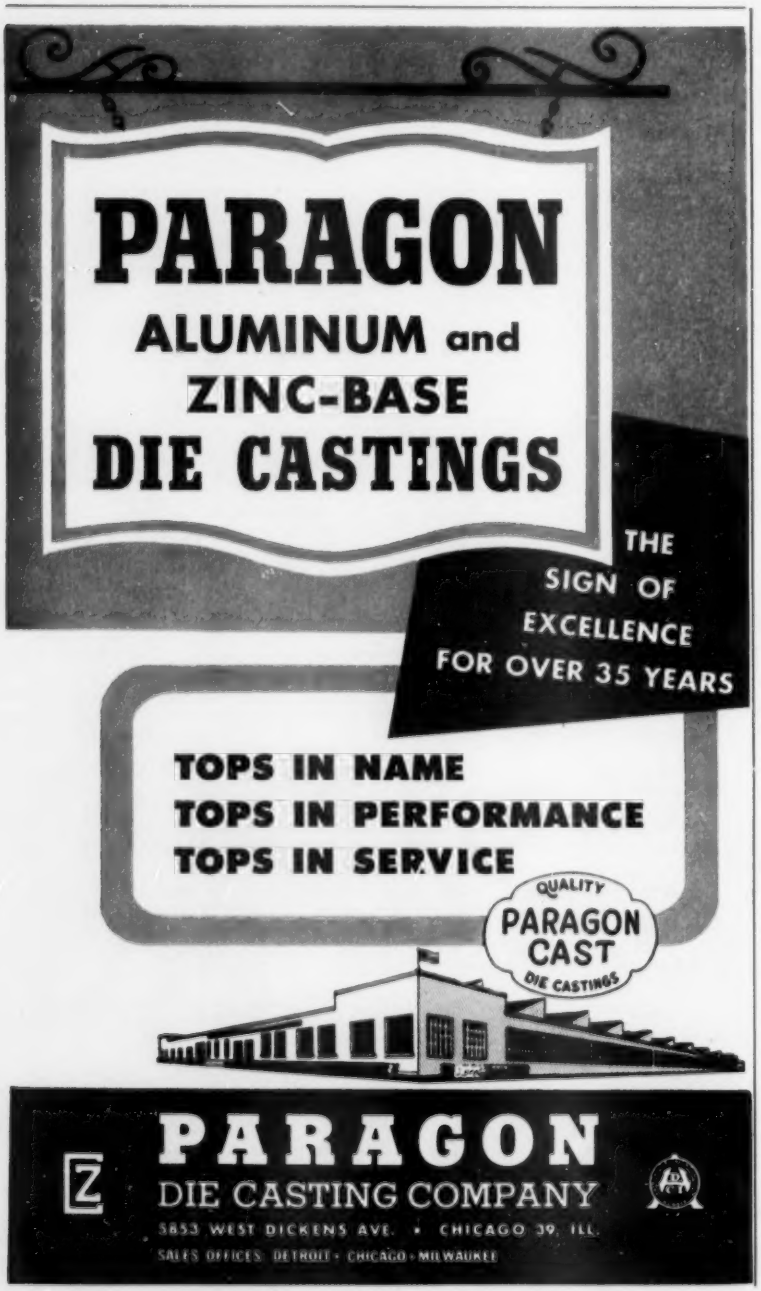

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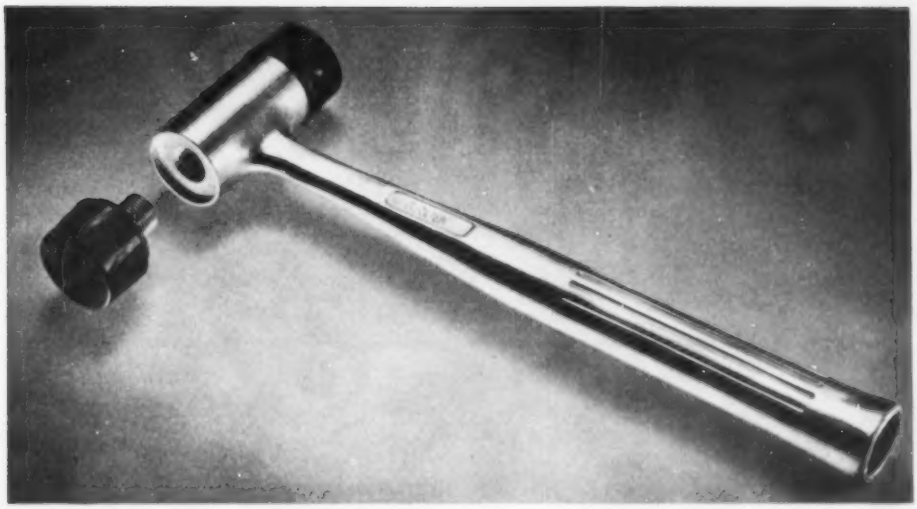
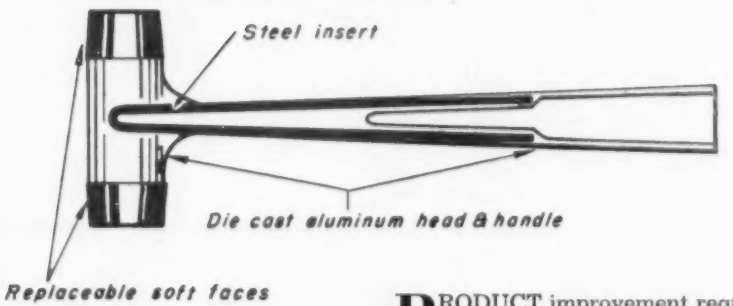




A WELL-BALANCED HAMMER has the quality known as "feel", obtained here by combining a light weight aluminum die casting with an insert of steel.

Steel Insert Gives Spring To Die Cast Hammer Handle

PRODUCT improvement requires a mixture of about equal parts of imagination and knowledge of various methods of fabrication. Bruin Mfg. Co. of Marshalltown, Iowa has shown this desirable combination in the design of their soft faced hammer.

In the imagination column was put the desirable qualities that such a tool should have — good feel, good grip, solid mounting of the soft faces, and proper strength and spring in the handle.

In the fabricating column was a sound knowledge of the potentialities and advantages of the die casting process.

This hammer, as can be seen illustrated above is constructed of a single aluminum die casting which forms the head and handle. Inserted in the die and cast in place in the handle is a loop of high strength steel rod, which gives the tool its strength and spring and allows the proportions to be designed for eye appeal and that important quality known as "feel." The recesses grooves and general contour of the grip combined with excellent balance make the hammer easy and pleasant to use.

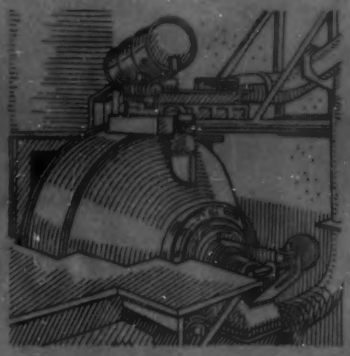
Another place where a die cast part has been used to advantage is the stud that secures the tips to the head. A die casting, threaded as a drill press operation, proved to be less expensive than a comparable screw machine part made from bar stock. In addition, the contour of the spud could be so designed that the best possible anchorage of the plastic face to the spud is secured.

By threading a cored hole in the hammer head to match the spud thread the soft faces are readily attached and will seldom loosen in service. This assembly is such that the soft faces will wear off rather than fall off as is the case with so many tools of this type.

To allow some variation of the weight, provisions are made to cast a zinc weight in the aluminum head. With the same head and handle casting either a 12 or 16 oz. hammer can be produced.

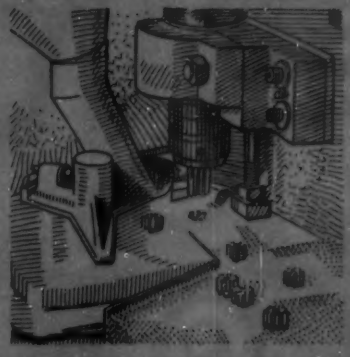
POWDER METALLURGY

MIXING AND BLENDING. Both properties and size of the final compact are materially influenced by the powder mixture used. Here powdered metals are being mixed and blended.



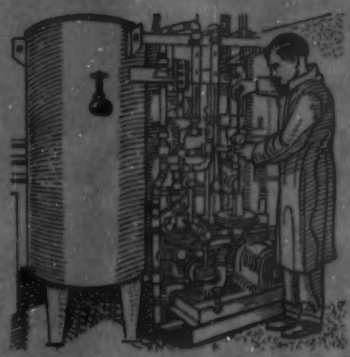
CLOSE-UP of one type of mixing and blending machine. Barrels, double cone, spiral screw and other types of mixing machines may be used, depending on the job to be done.

PRESSING. Fully automatic presses take the blended powders, fill the dies, compress the powder into a green compact and finally eject the molded piece.

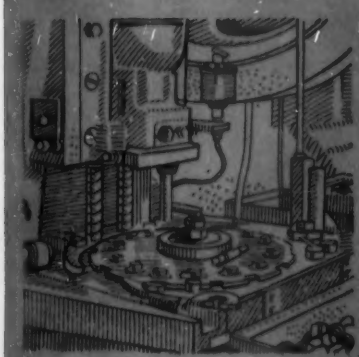


CLOSE-UP of typical parts as they are ejected from the die on the molding press. These parts are exact replicas of the finished piece with allowances for growth or shrinkage during sintering.

SINTERING. The green compacts go to a sintering furnace where, at a temperature below the melting point of the metal, the individual particles grow together to form a strong, homogeneous part.



ATMOSPHERE GENERATION. Sintering is done in a reducing atmosphere made by cracking ammonia, natural or artificial gas, or some similar process.



COINING. Where precise size control is required, the sintered compacts may be repressed, coined, to accurately size them. In many cases this operation is eliminated in the interest of economy.

IMPREGNATION. One of the features of powder metallurgy is special properties; self lubrication is one of these. Controlled porosity, readily achieved, with interconnecting pores allows oil impregnation.

Here is an outline of the powder metallurgy process, prepared to help designers and buyers understand the special features of this process.

POWDER METALLURGY

WHAT IT IS When irregularly shaped metal powder particles are pressed together there is an interlocking action of sufficient strength so that when pressure is released, the particles will stay in the shape to which they were pressed.

If a group of metal powder particles are pressed into some specific shape (this pressing at room temperature) and the resultant mass heated in a strongly reducing atmosphere at some temperature near, but below, the melting point of the metal there will be a growth of one particle into the others.

The result, if the heating is carried on long enough, will be a piece of solid homogeneous metal of essentially the size and shape of the original pressing. By shortening the time of heating the growth of the discrete particles into each other is lessened and hence there results a lesser degree of homogenization.

This process of pressing finely divided metal powders into a predetermined shape and then heating them to secure the desired amount of interparticle adhesion is powder metallurgy.

The limits of complexity of shape that can be produced and the physical properties that can be achieved are very wide.

Since the dies in which the metal powders are pressed are expensive and the cost of changing a press set-up considerable the process is essentially one of mass production. Because parts can be produced at high speeds (from as few as ten or less per minute up to 1000 or more per minute) it is readily apparent that only long runs are economical in most cases.

WHEN TO USE IT There are two general reasons for using powder metallurgy as a fabricating method. The first and most important is of course economics. When a part has such contours that it can readily be made from metal powders, or a partially finished part can be made; and when the number of pieces is sufficiently great to warrant the expense of molding dies and the relatively high metal powder costs, it may then be most economical to use this process to make the part.

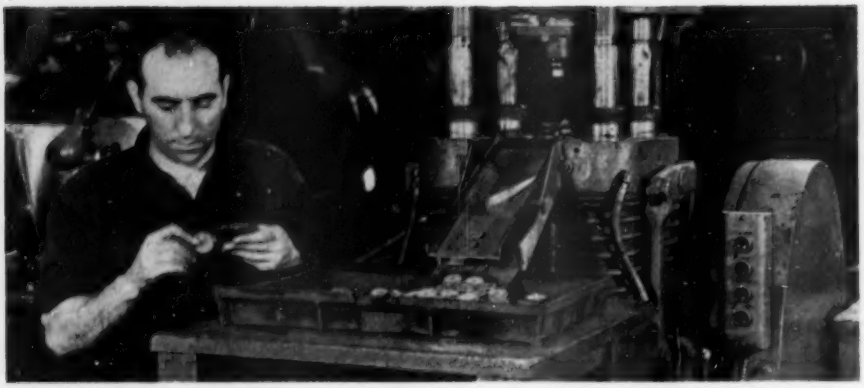
The first criterion is part shape. Since the metal powder is poured into the die and then compressed, it follows that the shape should be such that it can be readily ejected without disassembly of the die or fracture of the part. This eliminates undercuts, central flanges, reverse tapers and a few other shapes.

Area of the part is another limitation. Most modern high speed presses have relatively low total capacities. Pressing is done at from 10 to 40 tons per square inch, in most cases, so that within normal press capacities (in the order of 100 to 150 tons) the area on which pressure is applied is limited.

Length of the part in the direction of pressing is another limiting factor. In practically every case it is essential that the density of the finished part be nearly uniform over its entire length. As the part becomes longer the differences in density between the ends and the mid point become greater so that a practical limit is reached when the ratio of length to diameter of the part is around 3:1.

Required physical properties in the finished part may be another limiting factor. Generally speaking parts made from powder have lower physical strengths than a corresponding part made from wrought stock. This lowering of the physicals must be taken into account when designing for powder metallurgy.

EXAMPLES OF PARTS AND PROPERTIES →



DIMENSIONAL CONTROL is a great advantage of powder metallurgy . . . the ability to produce millions of pieces that are essentially duplicates and interchangeable.

Powder Metallurgy — cont.

The second basic reason for using powder metallurgy is that certain products and combinations of materials can be handled by powder metallurgy and by no other process. When either or both of these conditions exist, the designer has no choice but to use the process. A few examples of such products will make this clear.

1. A so-called self lubricating bearing is a sponge of metal powders with interconnecting pores. Areas of contact and growth across these areas is sufficient to give the necessary strength while the pore volume (usually around 30 percent of the total volume) acts as an oil reservoir. Capillary action draws the oil from the pores to the bearing surface where lubrication is desired. Obviously such a bearing will ultimately run out of oil, but the periods between oilings can be greatly extended through the use of these bushings.

2. Cemented carbide is another example of a material that cannot be made by any process other than powder metallurgy, as are the so-called cermets, combinations of metallic and non-metallic materials.

3. Uniformly distributed lead in a copper matrix can be achieved through the use of powder metallurgy and by no other means, and certain other "alloy" combinations such as the so-called heavy metal, fall in this same category.

ADVANTAGES Other than its ability to produce products that cannot be made in any other manner, powder metallurgy has a number of outstanding advantages for the designer.

In those cases where the number of parts to be made is sufficiently great to warrant the tooling costs and where the desired shape and physical properties fall within the limitations of the process some of the more oustanding advantages are:

Dimensional accuracy in the order of ± 0.005 per inch for normal production.

Small corner and fillet radii, $\frac{1}{64}$ inch or less, can be secured readily.

There is essentially no scrap loss in the process.

Inspection costs are drastically cut since once a proper cycle has been established to give a part that falls within specifications all subsequent parts, in general, will be nearly exact duplicates.

The greatest source of departure from specified dimensions will come with die wear and most of this can be reduced through the use of cemented carbide dies.

Where the physical properties of a part will permit the use of a somewhat porous piece the weight will be reduced in proportion to the decrease in density. This will result in cost lowering through material saving and through over-all machine weight lowering, in some cases this latter point can be of major importance.

Cored holes parallel to the direction of pressing can be made of almost any size from 0.050 diameter up to such a size that powder flow into the resulting annular space is no longer possible; this latter condition will vary depending upon the piece being made.

Both through and blind holes can be cored.

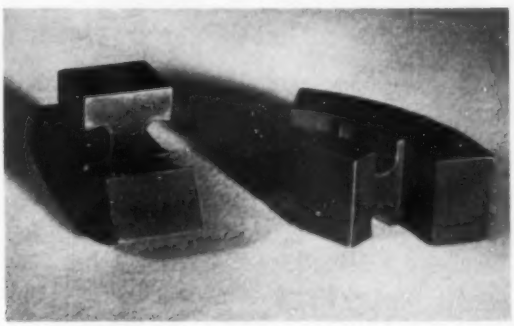
Where dimensional accuracy greater than is normally produced is required the parts can be sized or coined. In this process, the sintered piece is placed in a die and repressed. Die dimensions are such that when the piece is ejected it falls within the closer tolerances needed. This coining adds another step to the process and since it is considerably slower, as a rule, than the original pressing operation it can materially increase costs. Coining should be avoided whenever it is possible.

Continued on page 54

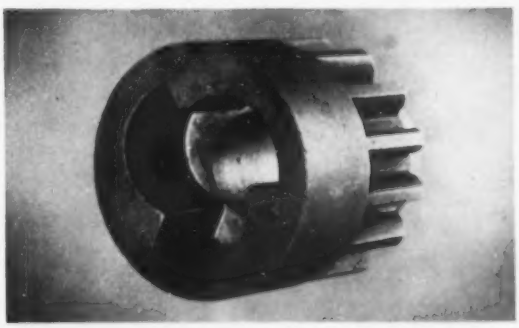
Versatility . . . The Key To Broader Usage For Powder Metallurgy

If there is one factor which will influence designers to use more powdered metal parts, it is the extreme versatility of properties, sizes, shapes and materials produced by powder metallurgy. Here are a few typical examples . . .

Automotive Specialties

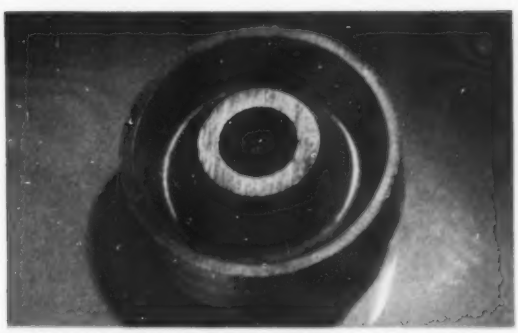


Portable Tools

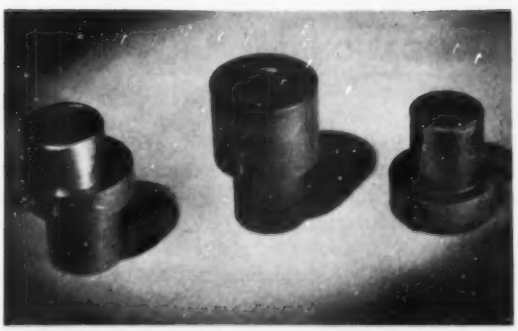


Power Transmissions

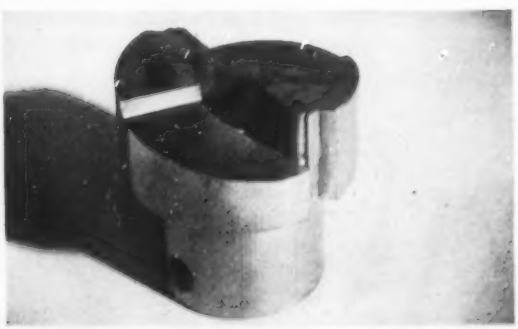
Plumbing Hardware



Textile Machinery



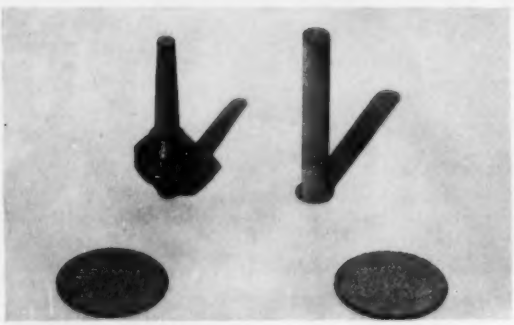
Household Goods



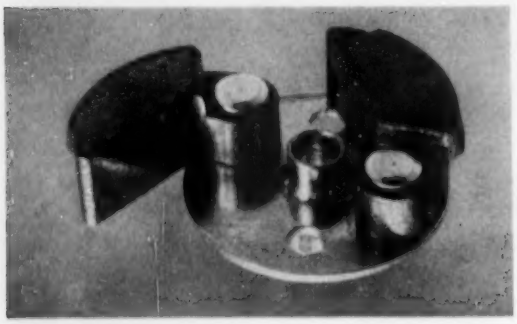
Control Mechanisms

Some Of The Special Properties Obtained By Powder Metallurgy:

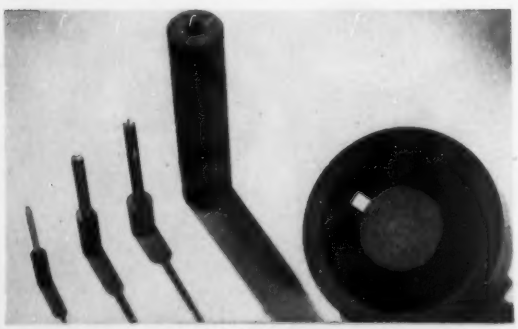
Bearing Properties



Porosity For Filtering



Friction Properties



Electrical and Magnetic Properties

Powder Metallurgy — cont.

Powder metal parts can be machined on the same equipment as parts made from wrought stock. Generally speaking, carbide tipped tools give the best results but must be sharpened differently for machining powder metal parts than for machining wrought stock. Because these parts are readily machined it is often economical to make a partially formed piece from metal powders and do only final machining.

METALS Almost all metals and alloys can be fabricated by powder metallurgical techniques. Aluminum, zinc, tin, lead and other low melting point metals are difficult to handle and in general should not be attempted except in extremely rare cases. For these metals, in the pure state, the costs of parts made from powders will almost always be very high.

Copper, copper base alloys, ferrous metals and ferrous base alloys (including most of the stainless steels) are readily handled by powder techniques at reasonable costs.

In all cases the metal powders are more expensive than wrought metal of the same composition, but the economies of the process will more than offset the increased metal costs.

The refractory metals such as tungsten and molybdenum are most readily handled by powder metallurgy.

COST When properly applied, powder metallurgy is a low cost fabricating method. While die costs may be high, the cost is amortized over a great number of pieces so that the proportionate per piece cost attributed to tooling is low.

The higher metal cost is, to some extent, compensated for by the absence of scrap and the lowered percentage of rejects due to machining errors in conventional methods. As noted, inspection costs are drastically lowered.

Where much or all of the machining is eliminated through the use of powder metallurgy the difference in labor costs between press and furnace operators and skilled machinists makes for the greatest saving in costs and this saving alone can more than compensate for the higher tooling costs and the higher metal costs.

APPLICATIONS There are few, if any, industry groups that do not apply powder metallurgy products to a greater or lesser degree. Outstanding applications are found in the automotive, household appliance, business and office machine, textile and sewing machine, plumbing supplies, and ordnance industries.

Generally speaking wherever a large or fairly large number of duplicate parts are required whose material, physical properties, and contour allow them to be made from metal powders there is a sound application for parts made from metal powders.

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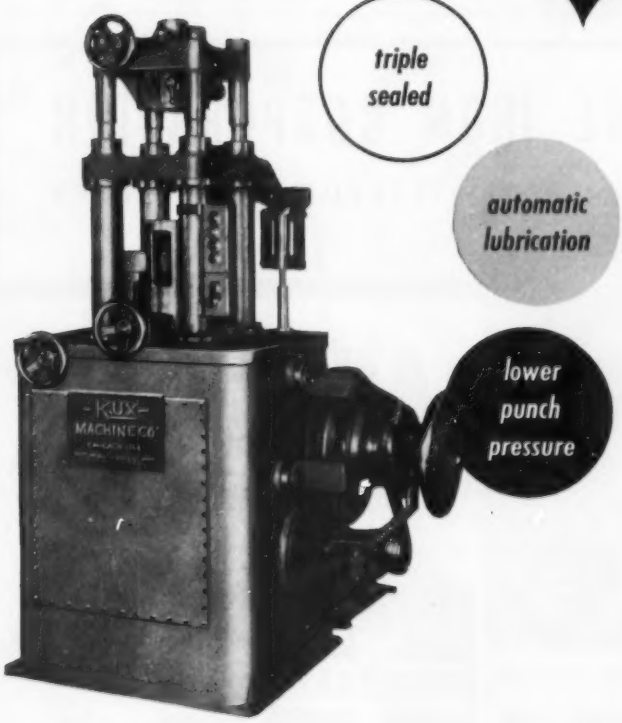

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Engineered into the Kux Big 4 Series, the finest tablet presses ever built, are:

- Complete automatic operation with only occasional filling of supply hopper with material for continuous production.
- Pressure applied to the material by both upper and lower punches — assuring uniform structure and high density in the formed tablet.
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METAL POWDER ASSOCIATION FALL MEETING HEARS ARMY ORDNANCE SPECIALIST

"PRIOR to Korea this country has had only two throttle settings for its industrial mobilization engine—either wide open, or almost completely closed," said Brig. General J. B. Medaris, chief, Industrial Division, Office of Chief of Army Ordnance, speaking before the members of the Metal Powder Association at the Second Fall Meeting. "In the case of the Korean emergency, however, we were faced for the first time with a condition of only partial mobilization where we were forced constantly to consider both the needs of war and the impact upon our civilian economy. As a major world power we believe we must realize that our military obligations for the foreseeable future are more apt to encompass 'brush fires' on the far flung frontiers of our defense than to crash into an all-out world conflict. Our system must, therefore, be adapted to an innumerable variety of throttle settings rather than only two."

Gen. Medaris appeared as the guest banquet speaker at the meeting of the Metal Powder Association, which took place September 10-11-12 at The Homestead, Hot Springs, Va. This marked the occasion of the second meeting of the members of the Association, attended by more than 100 members.

Discussing the role of the metal powder industry and the industrial preparedness program, Gen. Medaris said that the Ordnance Department prefers to favor small business wherever possible, ". . . because an examination of base war production shows clearly that the small industrial enterprises are the foundation stones to our whole industrial structure. Without making maximum use of the industrial resources of small business, we would not be able to establish a solid production base sufficiently broad to meet the full requirements of a national emergency. In a thousand surprising ways we find the reliable and progressive small industrial concerns occupying key production stops in the structure supporting even our largest and most complicated purchases."

Speaking of the necessity for careful planning, Gen. Medaris felt certain that, "the United States will be able to maintain a dynamic production base in a state of effective standby, or at a low cruising speed of operation, thoroughly capable of quickly accelerating to maximum production to meet any given combination of circumstances. The cornerstone of our plans is the substitute of 'effec-

Continued on page 81

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441 Lexington Ave. New York 17, N.Y.

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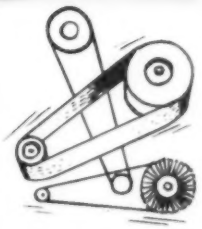
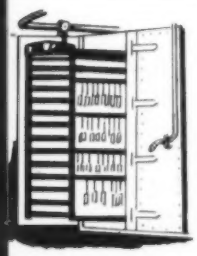
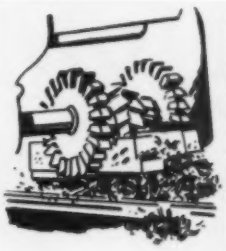
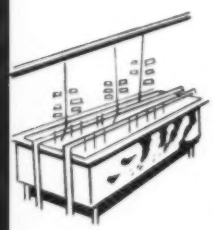
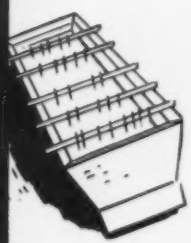
For more information circle No. 36 on the Reader Service Card

Finishing Section





Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

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PS

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YOU CAN GROUP YOUR ROTARY OPERATIONS ON A FLASH LATHE

By **A. KLUGE**, Vice President
J. M. Nash Co.

OF THE millions of die castings produced annually, a fairly great percentage of them are round so that they can be, if desired, rotated about a central axis. Most of these castings require some machine work after trimming, even if it is only the removal of vestiges of flash and parting lines.

Where castings can be set up for rotation about a central axis, automatic flash lathes can be applied so that deburring, flash removal, light machining and preliminary polishing can be set up on a high speed production line basis.

A typical lathe is shown in Figure 1. Each machine is equipped with ten spindles and with provision for tooling to be set up at three stations. In addition to the three regular stations, various tooling can be set between the stations so that five sets of tools, all in the same horizontal plane roughly, are possible. In some cases, tooling can be piled vertically where length of piece or size of tooling will permit.

The machines are built to operate on either a continuous turret rotation or an intermittent turret operation with a variable dwell and rate of approach at each station on the intermittent type of machine. Continuous and intermittent operation is not possible on the same machine, two units must be used.

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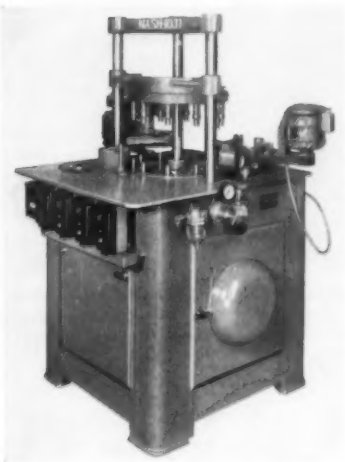
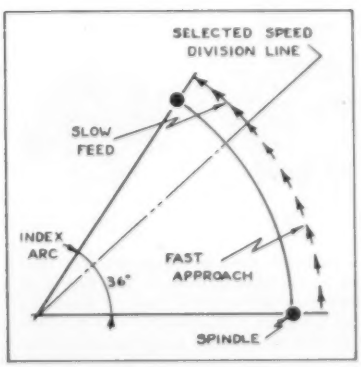


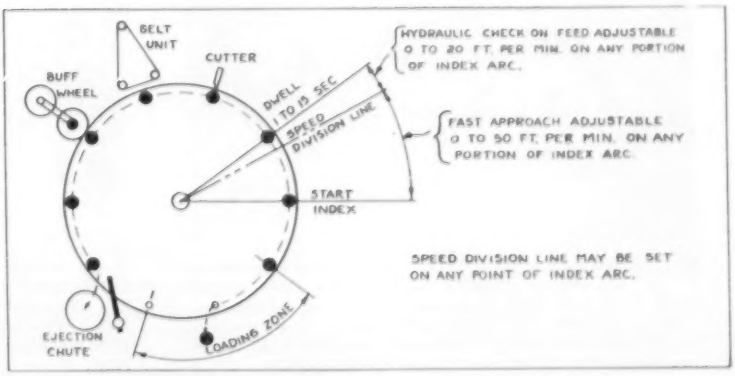
This Is A Typical Setup . . .

1. TYPICAL AUTOMATIC FLASH LATHE is this Nash 103-B, equipped with ten spindles and provisions for tooling at three stations.

2. POSITIVE CONTROL of index cycle is illustrated, below left, showing fast movement to a selected speed division line and slow feed to stop at tooling station.

3. TYPICAL TOOLING setup on the Nash 103-B is illustrated, right, showing that various types of tools can be used, located at any point in the index arc.




BELT UNIT
CUTTER
BUFF WHEEL
DWELL 1 TO 15 SEC
SPEED DIVISION LINE
START INDEX
EJECTION CHUTE
LOADING ZONE
HYDRAULIC CHECK ON FEED ADJUSTABLE 0 TO 20 FT. PER MIN. ON ANY PORTION OF INDEX ARC.
FAST APPROACH ADJUSTABLE 0 TO 50 FT. PER MIN. ON ANY PORTION OF INDEX ARC.
SPEED DIVISION LINE MAY BE SET ON ANY POINT OF INDEX ARC.

Rotary Operations Grouped — cont.

Typical operation cycles are shown schematically in Figure 2. In this case, only three sets of tooling are shown.

The head of the machine carrying the piece hold down pads is adjustable vertically to accommodate parts of varying length and in addition, the head can be raised so that it does not contact the parts for machine operations on the top face.

For average operations, diametral tolerances can be held to a total of 0.005 and where closer tolerances are required special tooling set-up arrangements can be made that will hold to 0.002.

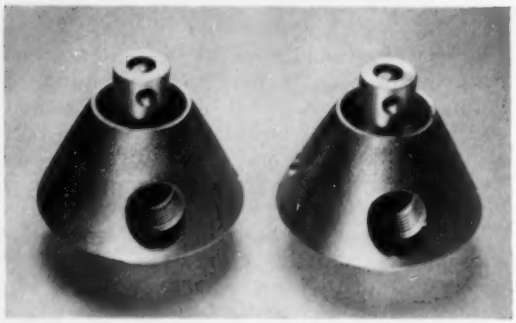
Spindle speeds are variable with standard speeds being 1200 to 3200 rpm on the continuous rotation unit and 700 to 2000 rpm on the intermittent motion machine. Production rates as high as 90 pieces per minute are possible.

While the spindles revolve continuously during machining operations, they are stationary on the ejection and loading points. Automatic ejection can be provided on both machines.

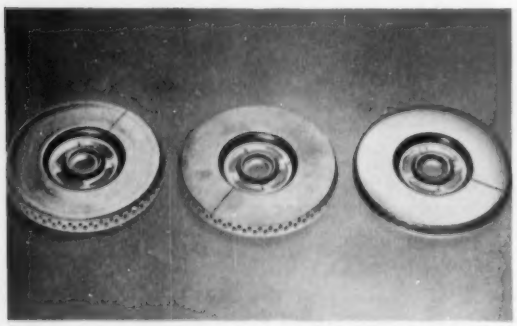
A wide variety of tooling is possible including: buffing wheels, abrasive or buffing belts, carbide files, micrometer adjustable cutters, crimping rolls, revolving knives for height trimming, grooving knives, grinding wheels, knurling rolls, etc. With some slight modifications, the lathes can be set up for automatic paint spraying of small parts.

A few of the many operations that have been performed on die castings are shown in the following illustrations. Obviously the machines are not limited to operations on die castings but can perform the same jobs on any metal or plastic parts within the capacity of the machines.

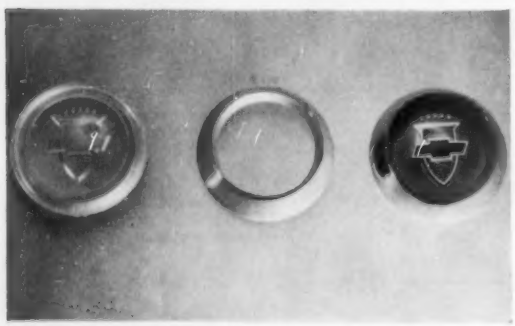
Here Are Five Typical Finishing and Assembly Jobs:



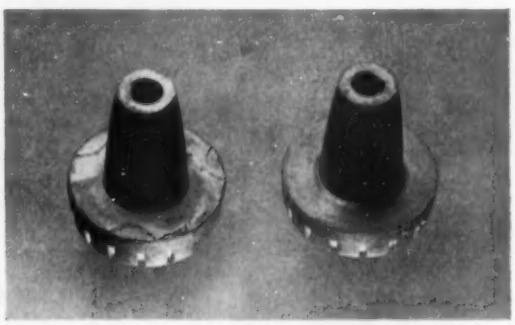
3. This is a deburring operation on fuse noses. As cast, there was a slight burr around the large hole. This burr was removed by sanding on a continuous motion machine.



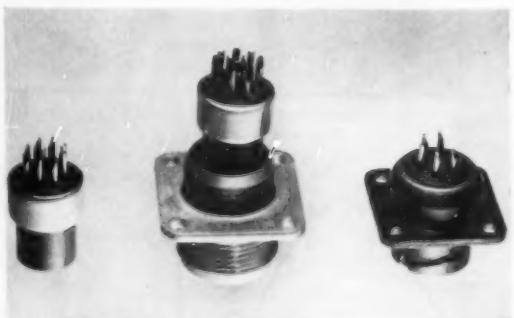
4. Surface polishing on a top surface of gas flame spreaders. This operation was done with the head pads raised so that a sanding belt could operate over the entire top surface. Only sanding was done on the flash lathe, final polishing was done on heavier duty equipment.



5. Spinning over a metal bezel onto a plastic ornament on an intermittent operation machine. The older method, using a standard lathe, produced 3 pieces per minute; now, with an automatic flash lathe, production has been increased to 37 pieces per minute. Increased production paid for the automatic lathe in three months out of labor savings.



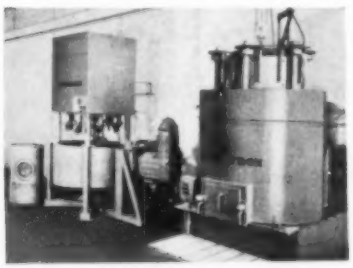
6. Light surfacing on the flat face was done on these zinc die castings. An intermittent type machine was used where the slow approach to machining position was particularly valuable in preserving the root diameter.



7. Edge rolling for assembly is done in two stages. The steel ferrule is fastened to the plastic body in the first step. This sub-assembly is then fastened into the die cast mount by rolling the edge to lock the inner part against a cast shoulder. Both operations done at high speed on a continuous operation lathe.

ROTO-FINISH LABORATORY TESTS SPECIAL PROJECT MACHINE

The Roto-Finish Co. has recently expanded its experimental laboratory facilities for the development and testing of abrasive media and barrel finishing machines designed for special purposes, that is, for finishing



parts which ordinarily do not finish well or may not be adapted to conventional Roto-Finish processes or equipment.

The new types of equipment are reported to be particularly useful for processing parts which may be held in special fixtures and oscillated or driven through special grinding media, due either to the kind of material that the parts are made from or to the form or shape of the parts in question.

Because of these additional testing facilities and the great amount of information which has been accumulated by Roto-Finish technicians, the new processes can be used for a variety of shapes of parts. Further information is available from the company located at 3700 Milham Road, Kalamazoo, Mich.

F. B. STEVENS EXPANDS

A new addition to the Springfield (Ohio) plant of Frederic B. Stevens, Inc., metal finishing and foundry equipment manufacturers, is now completed.

The new facilities have enabled the manufacturing operations to expand production of the Stevens line of barrel plating and metal processing equipment.

The company's production of dryers and their new metal finishing waste disposal equipment will also be speeded up.

A.S.T.M. HONORS SAM TOUR WITH AWARD OF MERIT

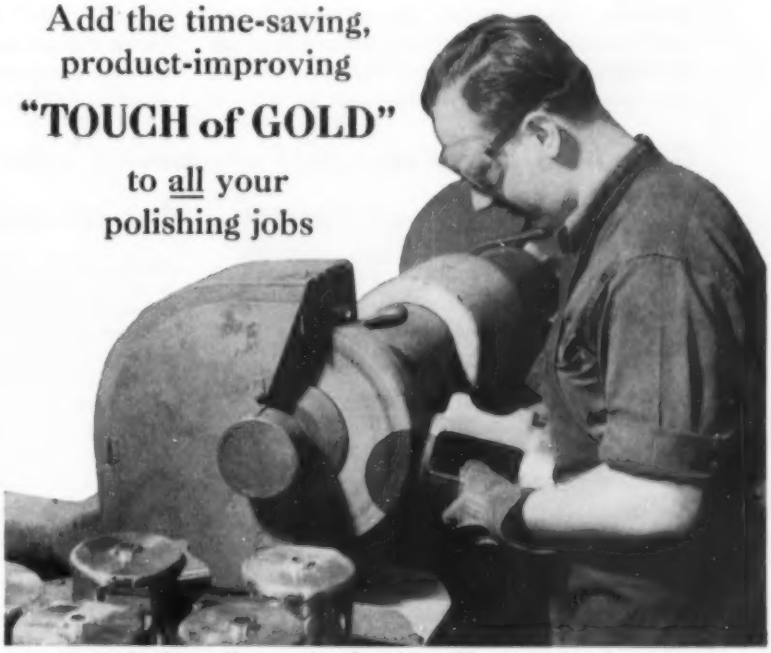
At the 57th annual meeting of the American Society for Testing Materials, Sam Tour, president of Sam Tour & Co., Inc., was honored by an Award of Merit "for long and fruitful service to the Society extending over many technical fields and administrative phases, for work on test methods, and especially for contributions to the metals and corrosion fields".

Mr. Tour's participation in ASTM's activities started 33 years ago. During these years he has become well known for his contributions on testing machines and on impact, stiffness, salt spray and corrosion testing.

Notable also are his papers on corrosion of non-ferrous alloys, die castings, aluminum alloys for pressure die casting, zinc-base die casting alloys, nomenclature and classification of cast copper and copper-base alloys.

A member of 14 different technical committees and 35 different sub-committees in this time, Mr. Tour has served as chairman for ten years of Committee B-7 on Aluminum and as chairman for four years of Committee B-3 on Corrosion of Non-Ferrous Metals.

Add the time-saving, product-improving "TOUCH of GOLD" to all your polishing jobs



Marine Equipment Parts get the value-adding "Touch of Gold" when polished with Norton ALUNDUM* abrasive

When you standardize on Norton ALUNDUM abrasive, every polishing job you do gets off to a better start — and finish!

One reason is because the grains in this Norton-developed abrasive are thoroughly uniform in size, structure and chemical composition. Which means thoroughly uniform polishing, with no oversized grains to mar surfaces, and no flats, slivers or undersized grains to loaf on the job. And you get *fast* polishing, too, because ALUNDUM abrasive is famous for rapid, clean-cutting action.

Another reason is that ALUNDUM is specially processed to give it high capillarity. With *all* grains soaking up cement or glue uniformly and adequately, *each* grain is held firmly — assuring long-lasting, top-performing polishing wheels.

These Advantages In YOUR Polishing mean better-finished, better-looking products in less time and for less money — the sure "Touch of Gold" you can add to all your set-ups, manual or automatic.

Your Norton Distributor can supply you promptly with ALUNDUM polishing abrasive in the types, sizes and surface treatments you need. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed in your phone directory yellow pages under "Grinding Wheels". *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-271

NORTON ABRASIVES

Making better products . . . to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

For more information circle No. 80 on the Reader Service Card

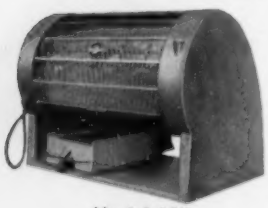
Come to TUMBLE GRAV-I-FLO FINISH

for higher lustre—
smoother finish on metal parts

You can get a far superior finish on metal parts with the Super-Brite chips and compounds employed in the Grav-i-Flo Tumbling Process. Developed by originator of modern mechanical finishing, these materials also cut much faster, and eliminate the need of transferring parts from the cylinder between roughing and finishing operations. They likewise eliminate subsequent operations such as ball burnishing for color.

And, the time-saving Grav-i-Flo process for finishing and deburring cuts direct labor costs too. Hundreds of companies are getting better finishing and deburring results, faster and cheaper. If you haven't checked these advantages to your competitive position, do so today! Invite Grav-i-Flo to make recommendations.

Grav-i-Flo offers complete equipment, accessories and supplies for all your tumbling needs!



Model 66", two compartments

Model 48", two compartments

Machines. Grav-i-Flo 66", 48", 36", 32", and 24" machines have cam locked doors with manually released safety stops; available with unlined or rubber lined cylinders, constant or variable speed drive, J.I.C. controls, and timers from 5 minute to 20 hour cycles. Equipped with electric wiring and water piping installed ready for plant hook up.

Model 36", two compartments

Model 32", two compartments

Model 24", two compartments
Designed For Small Lot Production and Laboratory Processing.

Compounds. Grav-i-Flo natural and synthetic deburring and finishing chips and highly developed compounds consistently outperform every type of tumbling process offered on the market.

Investigate. Grav-i-Flo superiority in equipment and supplies has been proved to hundreds of users in many different industries. Let us show you, too, at no obligation. Our representative will visit your plant, or you may send samples direct to us. Engineering Service available to all users.

SEND FOR CATALOG showing complete line of Grav-i-Flo equipment, accessories and supplies.

Grav-i-Flo Corp., Dept. PMM-10, Sturgis, Mich.
☐ Send complete catalog. ☐ Have Sales Engineer call. ☐ We are sending samples.

Company_____

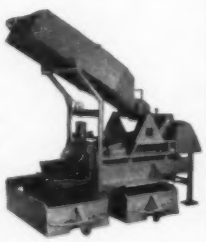
Name _____ Position _____

City _____ State _____

GRAV-I-FLO CORPORATION 400 Norwood Avenue Sturgis, Michigan

ACCESSORIES

Two deck parts-and-chips separator and chip grader.



Occupies less floor space. Separates parts quickly without impingements. Grades 3 sizes of chips simultaneously.

Other Grav-i-Flo accessories include tubular yoke hoist pans, chip pans, wash-out doors, screens, chip bins, unloading boots, dip tanks.

For more information circle No. 77 on the Reader Service Card

You Can Save Money And Time In Assembly If You

Pick A Screw That Forms Its Own Thread

THE CORED HOLE in a die casting is the starting place for economical assembly. Holes can be cored accurately as to diameter and location, so that the mounting holes for complex assemblies can often be formed as an integral part of the casting to save separate drilling.

But even where it seems more economical to drill, rather than to core the hole because of its size, location, depth, etc., it is possible to reduce assembly costs by introducing screws which form their own thread. The die cast alloys are soft enough to permit speedy driving of such screws, yet tough enough to resist thread stripping, as is common in molded plastic assemblies.

Three general types of thread-forming screws are in general usage: the screw that rolls or compresses the material into which it is driven, the screw that cuts its thread by removing metal, and the drive screw that is hammered or pressed into the hole.

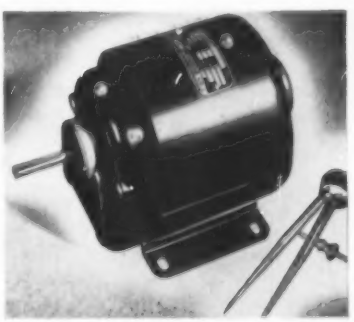
Each of these types has its specific applications in the assembly of die castings, or the mounting of other types of parts on to die castings. The designation of a fastener is best accomplished at the design stage, when the product is being developed, rather than as an afterthought. Money can be saved all along the line, starting with initial tooling, when foresight is employed, although saving of money and time on the production line is the principle benefit of such design for assembly.

Illustrations and brief descriptions of four types of thread-forming screws are presented for the guidance of the designer and production engineer. All the material is from Parker-Kalon Div., General American Transportation Corp.

Slotted, Self-Tapping

A HARDENED, self-tapping screw of this type forms its own thread by rolling or compressing the material into which it is driven. It is used on zinc, aluminum, brass and magnesium die castings and other non-ferrous castings. In the Redmond Micromoter, right, three of these screws attach the external oil catcher assembly to the frame. Two more fasten the internal oil catcher. A steel guide on the power screwdriver protects the operator and permits faster driving.

Small Motor Assembly



Continued next page

Hex-Head Tapping

GREATER TORQUE LOADS can be applied with a hex-head tapping screw. Thread forming is same as that shown on page 63, but hex-head allows more rapid driving with positive control. This type is often favored for production assembly. This electric iron uses 9 hex head tapping screws to fasten the 1/16" steel pressure plate that seals in the heating unit, and the automatic thermostat to the die cast aluminum base. More than 2,000,000 of these screws have been used without failure from loosening despite pressure of expanding and contracting metal.

Electric Iron Assembly

Thread-Cutting

BOTH A TAP AND A SCREW, this type of fastener has its own tap-fluted pilot that cuts a standard machine screw thread as it is turned in, giving close thread-to-thread fit for maximum security. Since displaced metal is removed in cutting the thread, it can be used even in the thinnest section die casting. Five of these screws are used in assembling these zinc base die castings for a floor polisher, avoiding tap breakage in blind holes which previously resulted in prohibitive spoilage of expensive castings.

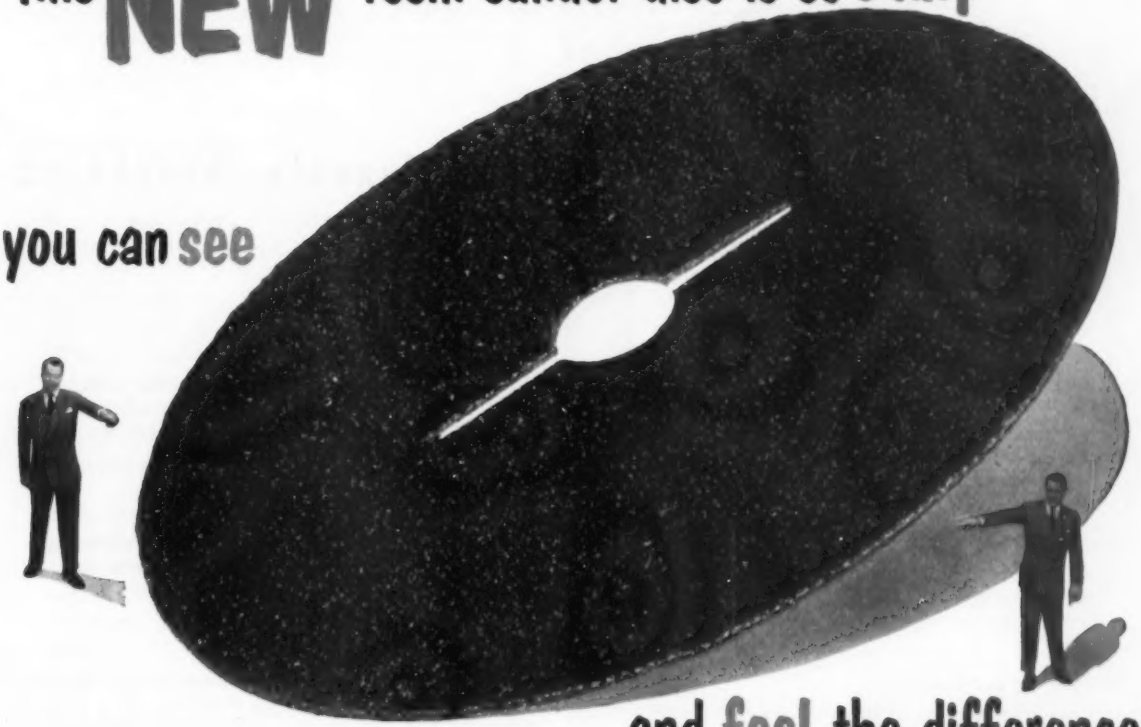
Floor Polisher Assembly

Drive Screw

FOR PERMANENT FASTENING where disassembly is unnecessary, hardened metallic drive screws can be used. It is hammered or pressed into a plain cored or drilled hole, and the steep spiral thread worms its way into the metal for a strong, permanent assembly. A drive screw in this pneumatic tool serves as a thrust bearing for a steel ball, thus permitting rotation and oscillation of the shaft. Two other drive screws fasten the name plate.

Pneumatic Tool Assembly

This NEW resin sander disc is so sharp you can see



and feel the difference!

You never saw a sander disc that *looks* so sharp... *feels* so sharp... *cuts* so fast, free and cool. It's the all-new Resin Sander Disc by CARBORUNDUM.

Test it on the toughest sanding job in your shop. See how it beats any other disc — for cutting ability, long life, uniformity. Notice how the edge holds its shape longer, and how the abrasive grain stands up under the most severe grinding conditions. And you'll find it *stays* uniformly sharp, from start to finish.

WHAT'S NEW IN THESE DISCS? EVERYTHING:

The abrasive grain is an improved type; the resin bond is engineered to provide more holding power; a new and tougher fiber is used in the backing. And rigid new manufacturing controls assure highest uniformity from disc to disc, from order to order...to give you truly dependable performance.

Sander Discs by CARBORUNDUM come to you in moisture-resistant boxes to keep them "factory-fresh" and to make handling and storage easier.

FOR A FREE DEMONSTRATION...call your CARBORUNDUM Distributor or Salesman, listed in the yellow pages under "Abrasives" or "Grinding Wheels." Or write The Carborundum Company, Dept. PM 82-417, Niagara Falls, New York.

CARBORUNDUM

REGISTERED TRADE MARK

...continually putting more SENSE in your abrasive DOLLAR

82-417

For more information circle No. 74 on the Reader Service Card

Product Facts

Catalogs · Manuals · Brochures

PROCESSES

Permanent Mold Castings: 144

A brochure covering the facilities of the company and showing many examples of the intricate parts they have cast is available from Michigan Wheel Company.

Die Cast Parts: 145

The facilities, the alloys cast, and the unique services of the National Die Casting Co. are given in an eight page brochure recently published by the company.

Metal Powder Bushings: 146

A new catalog has been issued by the Wakefield Bearing Co. giving, in addition to general descriptive material, a full description of several new (patented) bearings and data sheets on strength, frictional properties, etc. of metal powder bushings.

Frozen Mercury Castings: 147

How the use of frozen mercury patterns gives larger and more complex investment castings is graphically presented in a comprehensive new booklet on the Mercast process, just issued by Mercast Corporation.

MATERIALS AND EQUIPMENT

Wire Thread Inserts: 150

Heli-Coil Corp. has just issued a new brochure listing the standard thread inserts available from stock in all of the standard threads and many of the non-standard ones.

Immersion Heaters: 151

For maximum flexibility in tank or bath heating, immersion heaters are widely used. Glo-Quartz Electric Heater Co., Inc. has a new booklet describing its units and giving operating data, current consumption and size specifications.

Lathe Accessories: 152

South Bend Lathe Works has issued a new catalog listing all of the accessories and attachments for the complete line of South Bend lathes.

X-Ray Inspection 153

A quarterly magazine devoted to the uses of X-ray equipment in the inspection of products and for X-ray diffraction work is published by the General Electric Co.

Tapping Tools: 154

A bulletin recently issued by Automatic Methods, Inc. fully describes the complete line of lead screw tapping tools made by that company.

Die Casting Machines: 155

Reed-Prentice Corp. has a new catalog describing their combination die casting machines. One machine for zinc, tin or lead base alloys, the other for aluminum, magnesium or bronze.

Industrial Lubricants: 156

All types of industrial lubricants containing graphite are described in a four page brochure issued by Gredag, Inc.

FINISHING

Bright Nickel: 162

A new brochure on bright nickel plating has been issued by United Chromium, Inc. Given are brief statements of the uses and advantages of the Unichrome process.

Aluminum Protection: 163

The natural resistance to corrosion of aluminum are reported to be increased and better paint bonding secured through the use of Alodine No. 1200. The complete process and some typical results are given in a brochure from American Chemical Paint Co.

Zinc Brighteners: 164

Descriptive literature is now available on brightening agents for use with zinc plating in barrels. Three brighteners developed by the Promat Div. of Poor & Co. are described.

Power Washing: 165

Power spray washers for all types of product and a wide variety of applications are described in a booklet that has been issued by Peters-Dalton, Inc.

To get copies of any item listed here, simply circle the appropriate number on Reader Service Card bound into this issue.

Buffing Compositions: 160

A group of 16 laboratory-verified reports on polishing and buffing compounds are contained in a booklet that is available from Frederic B. Stevens, Inc.

Phosphate Coatings: 167

The advantages of and the equipment for phosphate coating of metal parts are fully described in new publication from Metalwash Machinery Corp.

Blast Cleaning: 168

The Pangborn Corp. has published a new booklet giving factual data and engineering information on continuous flow Rotoblast barrels.

Faster Nickel Plating: 169

Hanson-Van Winkle-Munning Co., has complete data sheets, engineering reports, and technical information available on a new nickel plating process said to be 75 percent faster, more versatile, easier to control and capable of producing harder deposits than other sulfamate processes presently available.

Round Chromium Anodes: 170

In a brochure just issued, United Chromium, Inc. has announced its new round anodes for chromium plating. The new anode shape is said to give greater conductivity, longer life, and good contact. Improved quality of chromium plate is reported from these anodes.

Barrel Finishing Compounds: 171

Two new finishing compounds are described in literature available from Almco Supersheen. One of these a heavy duty material for heavy deburring and grinding operations and the other an economical grinding material especially designed for burnishing of zinc, aluminum, brass and copper.

Chromium Plating Unit: 172

A folder from The Dawson Corp. describes their small chromium plating unit especially designed for the recovery and rehabilitation of tools and dies.

Line of Polishing, Buffing Lathes: 173

A complete line of polishing and buffing lathes are featured in a new bulletin now available from Frederic B. Stevens, Inc. In addition to ten models of constant speed lathes designed for various operations, this bulletin also describes four models featuring variable speed operations.

How to Machine & Grind Titanium: 174

In a 16-page booklet, The Cincinnati Milling Machine Co. presents a great deal of basic information on the methods of machining and grinding titanium.

ALMCO

Supersheen

SPEED FINISHING

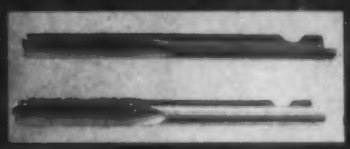
ALBERT LEA, MINN

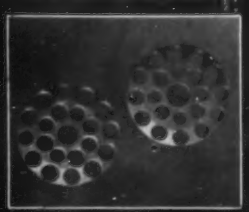
BARREL FINISHING

ABRASIVE

COMPOUNDS

THE RIGHT COMPOUNDS FOR YOUR SPECIFIC NEEDS—WITH THE RIGHT CHARACTERISTICS FOR BEST RESULTS





Supersheen Abrasive Compounds are formulated for use with *all types* of barrel finishing machines —they produce an infinitely *superior* grinding action—and can be used with *all types* of chips or metal media. They will increase the cutting action of any chip—and long-lasting qualities reduce your compound cost.

Send today for complete details of Almco Supersheen Compounds. Over 40 different standard types!

ALMCO Supersheen

AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT – MATERIALS AND COMPOUNDS

ALBERT LEA, MINNESOTA

Circle No. 71 on the Reader Service Card

when you THINK of FASTENERS think of CENTRAL...

CENTRAL MAKES EVERY TYPE FOR ALL DIE-CASTING ASSEMBLIES!

TYPE "1" THREAD CUTTING

Better for metal where a thread cutting action supercedes thread forming. Type "1" Central Thread Cutting Screws drive with minimum torque to form a perfectly mated thread and a tight fit. Interchangeable with standard machine screws.

TYPE "23" THREAD CUTTING

Note the wide thread cutting slot that works better in softer metals such as aluminum and zinc, or in harder metals where the wide slot affords better cutting advantages.

TYPE "25" THREAD CUTTING

Here the exclusive wide flute cutting slot combines with a specially spaced thread for low driving torque, high resistance to stripping and extra-free cutting action. Ideally suited to soft metals and plastics. Write for full details.

DRIVE SCREW TYPE "U"

TYPE "A" TAPPING SCREWS

Pointed and augur-like, the Central Type "A" Tapping screw pulls and forms thinner (.015" to .050") sheets of metal into a matching threaded section from punched, drilled, or nested holes. Available with slotted, Phillips, clutch or hexagon heads.

TYPE "B" TAPPING SCREWS

Die-pointed and augur-like for thicker metal (.050" to .200"), Central Type "B" Tapping Screws pass through a hole in one piece, form their own threads to lock both parts securely. For porous castings, non-brittle plastics, fibre and asbestos materials.

TYPE "C" TAPPING SCREWS

Recommended for general use in metals from .030" to .100" thickness. Standard pitch thread interchangeable with standard machine screws. Ideal for chip-free assemblies. Second assemblies can be made on projected end of the screw.

1914 • 1954
SERVING INDUSTRY MORE THAN 40 YEARS

"You Can Depend on Central"

CENTRAL SCREW COMPANY

3501 SHIELDS AVE., CHICAGO 9, ILLINOIS
3028 E. ELEVENTH ST., LOS ANGELES 23, CALIF. • 149 EMERALD ST., KEENE, N. H.

For more information circle No. 75 on the Reader Service Card

New Products ... the Reader Service Cards will bring full details

TAPPING ATTACHMENT
. . . eliminates all gears

A new reversible unit for high-speed thread cutting with small taps has been introduced.

The attachment is said to be unique in design with a minimum of rotating parts. All gears have been eliminated and an axial ball bearing functions as a planetary gear transmission for reversing.

The drive clutches are of the tapered type and are so combined with the axial ball bearing that the tap can be started slowly in both directions, irrespective of spindle speed.

Homestrand, Inc.
For more information, circle No. 203 on the Reader Service Card

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CORE ROD PROTECTION
. . . by flame plating

Flame Plating of core rods with tungsten carbide is reported to extend their life 30 times longer than uncoated steel rods. Reports from one manufacturer show that steel rods were no longer usable after 10,000 pieces had been produced because of a 0.0001 wear limit, whereas Flame Plated rods produced 291,900 pieces without noticeable wear.

The process consists of depositing a thin coating of tungsten carbide on surfaces of parts or tools where extra wear-resistance is needed. This combines the toughness of the base metal with the wear-resistance of the surface coating.

Temperature of part being plated does not exceed 400 F, and semi-finished parts can be Flame Plated without distortion or change in physical properties. Coating may be left in the as-coated condition (similar to fine emery) or finished down to 1-5 microinches rms.

Linde Air Products Co.
A Div. of Union Carbide & Carbon Corp.
For more information, circle No. 206 on the Reader Service Card

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PENCIL TYPE GRINDER
. . . has simplified speed control

Finger tip speed control heads up the new features of the improved model of a pencil grinder recently announced by the manufacturer.

The control is now a flush integral part of the back cap assembly of the grinder. This places it within easy reach of the thumb of the hand using the tool, or may be conveniently operated by the forefinger of the other hand.

The control has a fast operating valve which requires only a quarter turn in either direction to move it from full open position to completely shut off position.

The improved model weighs just under 6 oz. It is identically the same length as an automatic lead pencil, 5⅛ inches, which affords a balanced feel in the hand of the operator.

Air Equipment Corp.
For more information, circle No. 198 on the Reader Service Card

Continued next page

IMPREGNATED BUFF MATERIAL
. . . needs no break-in

An improved metal-finishing buffing wheel, recently announced, cuts faster than former company models and wears 30 percent longer.

Tested during regular production runs, the new buff practically eliminates break-in time. At one installation, for example, it was found that no rejects were turned out by the new buff after five minutes breaking-in, where conventional buffs frequently took a half-hour to break-in.

The new buff is impregnated with the same organic material that is used as a binder in buffing compounds. This marks the only difference between the new line of buffs and the company's standard line.

The application of this binder permits thread ends to retain the compound more easily, more quickly and in larger quantity.

Hanson-Van Winkle-Munning Co.
For more information, circle No. 197 on the Reader Service Card

MASTER ALUMINUM ALLOY
. . . specifically for foundry

Two new master aluminum alloys at regular pig prices have been announced.

The new master alloys are designed as no. 2364 and no. 2393. No. 2364 alloy has an analysis of 6 percent silicon, 4 percent copper, nominal iron, balance aluminum. No. 2393 alloy contains 9 percent silicon, 3½ percent copper, ¾ percent iron, balance aluminum.

With these two new master alloys, the manufacturers claim the foundry industry now has a complete family of master alloys available.

Reynolds Metals Co.
For more information, circle No. 199 on the Reader Service Card

NONFLAMMABLE SOLVENT
. . . for cleaning and degreasing

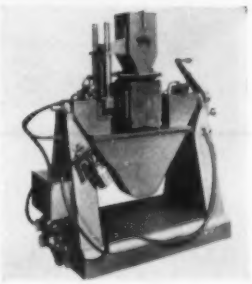
The first large-scale production of a new nonflammable solvent for use in the metal industry has recently been announced.

The new product known to the trade as Chlorothene is an inhibited 1,1,1-trichloroethane. The solvent is useful for metal cleaning and degreasing and is described as having low toxicity and nonflammable.

While the basic material — 1,1,1-trichloroethane — by itself may corrode aluminum and aluminum alloys, the new inhibited grade is said to virtually eliminate such corrosion except under the most drastic conditions.

Dow Chemical Co.
For more information, circle No. 201 on the Reader Service Card

SHELL CORE MACHINE
. . . said to be very high speed



A new machine that is said to be the first one commercially available to produce shell cores for use with green sand, permanent and shell molds has been announced. The machine is reported to be capable of delivering a completed core every 30 to 50 seconds, depending on core size and wall thickness. With multiple cavity core boxes a proportionately higher production rate is secured.

Available for either gravity investment, with sand hopper and shutter, or for blown cores, with a blow head, the machine can be used with most existing core boxes.

In addition to excellent collapsibility and burn-out properties, it is claimed that shell cores offer advantages comparable to those of shell molds, including low cost, light weight, intricate detail, etc.

Shalco Engineering Corp.
For more information, circle No. 204 on the Reader Service Card

Continued on page 73

WE OWN THIS QUARRY

The products of this Wisconsin quarry have been used for many years by a nationally prominent tumbling supplier, whose name will be furnished upon request.

CHIP SIZES

#1 1¼ to 1¾	#3½ ½ to ⅝
#2 ⅞ to 1¼	#4 5/16 to ½
#3 ⅝ to ⅞	#5 ⅛ to 5/16

Other sizes on request.

Processed Limestone and Granite Chips
FOR PRECISION TUMBLING

Other tumbling supply companies charge 15¢ a pound for these same chips. We charge only . . .

8¢ LB. Packed in 100 lb. bags. Prices f.o.b. quarry.

. . . because we sell direct from quarry to manufacturer.

X100 BURNISHING COMPOUND 20c LB.

For years the products of this quarry have been used in processing parts for the majority of American manufacturers including:

FORD	GENERAL ELECTRIC	BORG-WARNER
GENERAL MOTORS	DE VILBISS	WHIRLPOOL
CHRYSLER	WESTING-HOUSE	DOEHLER-JARVIS
BENDIX	AUTO-LITE	MINNEAPOLIS-HONEYWELL

Write today for FREE chip samples so you can compare them.

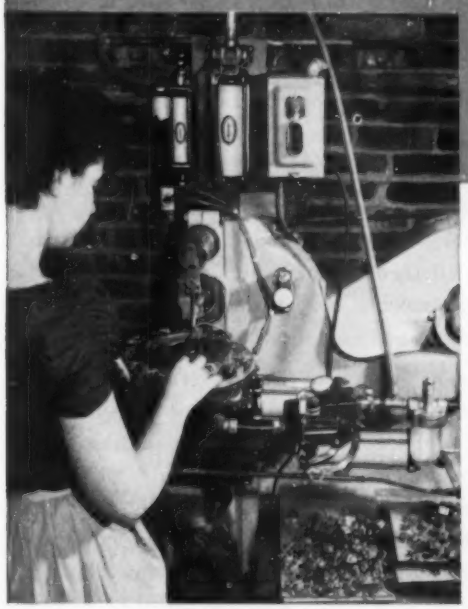
UNIVERSAL TUMBLING SUPPLY CO.

Phones: VE 8-2071 • WO 3-9445

14337 MANSFIELD • DETROIT 27, MICHIGAN

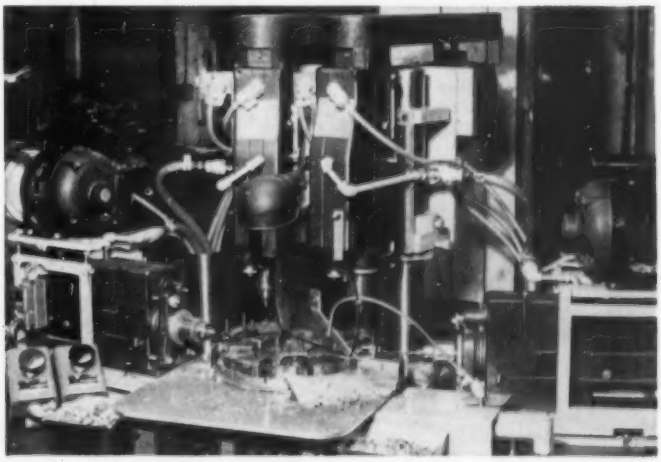
For more information circle No. 84 on the Reader Service Card

WITH THIS UNIQUE AIR MOTOR

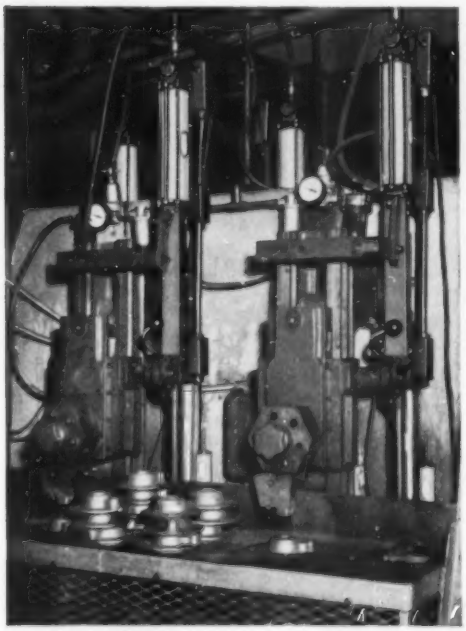


you can build cost-cutting special machines or modernize existing machines right in your own shop with your own personnel

This semi-automatic set-up at Eastman Manufacturing Co. doubled production and eliminated fatigue in milling bakelite magneto parts.



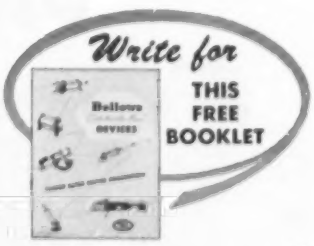
This drilling machine, built by Horrocks-Ibbotson, turned out 1 year's production of their fishing reel pawl blocks in 3 months.



A simple installation cut lathe time on steel ordnance parts from 90 to 10 seconds per piece at Joseph Pickard's Sons of Philadelphia.

Even for short runs you'll find special machines built around this versatile power unit will pay off in a big way — in greatly lowered costs, in fewer rejects, in better product quality. No expensive engineering is needed. In fact, your local Bellows Field Engineer may have in his Foto-Facts File basic designs that can be readily adapted to your product and your production processes.

Your own tool room can build such special machines at decidedly low cost, and quickly. Often they pay for themselves with the first week's savings.



Bulletin CL-50 tells the story of the Bellows Air Motor and the part it is playing in cutting manufacturing costs in hundreds of plants. Address: The Bellows Co., Dept. PMM-1055, Akron 9, Ohio.

The Bellows Co.

IN CANADA: Bellows Pneumatic Devices of Canada, Ltd.
4972 Dundas St., W., Toronto, Ontario

917-A

For more information circle No. 73 on the Reader Service Card

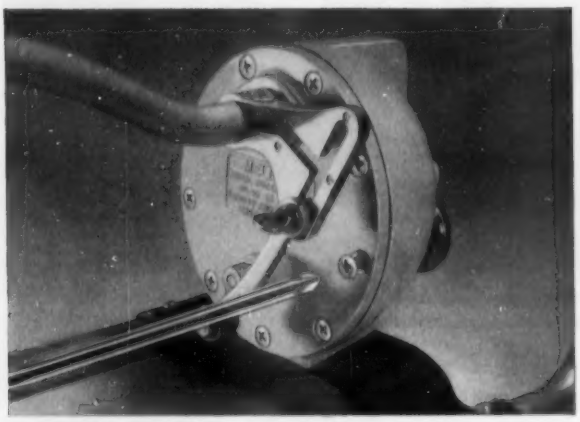
Are Your Fasteners HEADED FOR TROUBLE?

P-K STANDARDS protect you against these and many other symptoms of Screws "headed for trouble". They don't "get by" P-K inspectors—that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality".

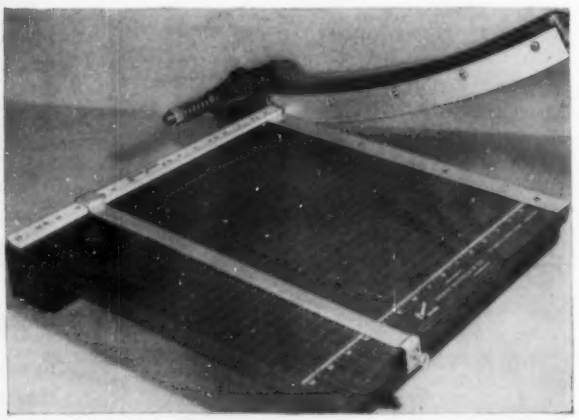
Screws are sometimes like people. If they "lose their heads" under pressure — if they turn out to be "softies" — if they don't "square up," they are headed for trouble.

The difference between screws made to P-K Standards and those that are "headed for trouble" is hard to see at a glance, but the effects of screw failure (parts spoilage, high reclamation expense, hidden weakness) are quickly evident in mounting assembly costs and customer complaints.

P-K Self-tapping Screws are "headed for savings" — not only headed, but threaded, pointed, and heat-treated with the same purpose — to keep your assembly lines trouble-free. That's why so many *more* manufacturers of America's best-known products specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer. Or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.



"SWINGIN' SPRAY," MELNOR Products Co.'s popular lawn sprinkler keeps on "swinging" because the oscillating mechanism is separate and sealed from the water intake system. To assure equally dependable assembly strength, resistant to the roughest handling, Melnor fastens zinc and aluminum parts with P-K Screws, 7 Phillips Head Type Z and 18 Type F, driven with air tools.



IN THE PREMIER CUTTING BOARD, made by Photo Materials Co., when 21 P-K Type A replaced wood screws to fasten the ruler, straight blade, bearing casting, and bottom cleats to the hard maple board, pilot holes were eliminated. The 5 P-K Type F Screws that now fasten curved blade to cast iron handle ended tapping. Power driving further speeds assembly.

PARKER-KALON®

The Original SELF-TAPPING SCREWS

IN STOCK . . . see your nearby P-K Distributor

For more information circle No. 82 on the Reader Service Card

SPRAY DECORATING MACHINE
. . . has high capacity

A new stationary gun pressure contact spray decorating machine for painting areas up to 3 x 1½ inches has a capacity of up to 1500 parts per hour depending on the shape and size of the part, according to the manufacturer.

The machine is said to be ideal for painting depressed or raised spots on die castings, fine detailed dials and control knobs, bumper guards, headlights, etc. on toy autos and the like.

By placing the part into the mask and depressing the table top about ¼ inch the operation is started. A timer controls the length of time that the gun is spraying so that exactly the same amount of paint is applied to every piece regardless of the rate of operation.

The machines are readily portable, requiring only 18 x 36 inches floor space and are 36 inches high to the center of the mask plate.

Conforming Matrix Corp.
For more information, circle No. 196 on the Reader Service Card

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TUMBLING MEDIA
. . . dry polishing small parts

A new tumbling medium for the dry polishing and deburring, specifically of small parts, jewelry, etc., has recently been put on the market.

The new compounds are already in use on a production scale. They are reported to be easy to use and are said to result in sparkling finishes resembling those obtained on a soft coloring wheel.

Tumb-L-Matic, Inc.
For more information, circle No. 200 on the Reader Service Card

---

NEW METAL CLEANER
. . . for pre-phosphate use

A new metal cleaner specifically designed for spray cleaning of metals before phosphate coating has been introduced.

The material, known as Paint-

now you can get this brilliant finish directly on zinc die castings!

No electroplating--no mechanical finishing!

PART AS CAST

TREATED WITH NEW IRIDITE

NEW IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

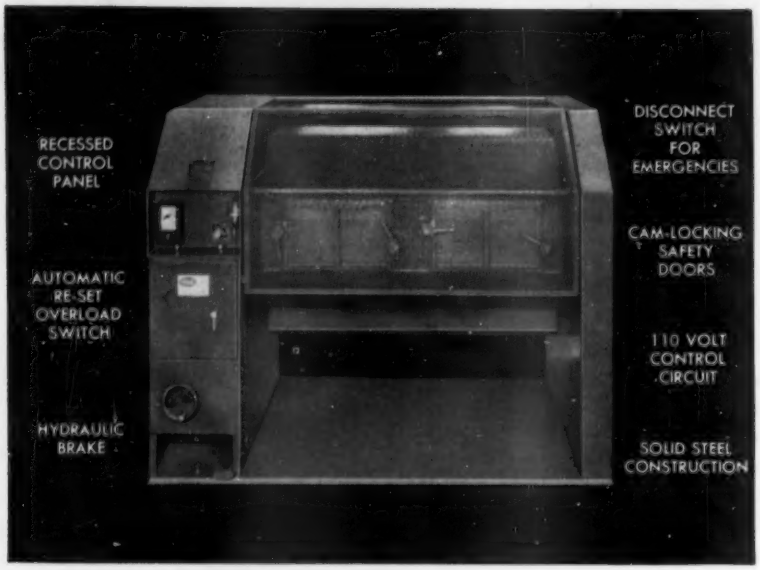
LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals

For more information circle No. 70 on the Reader Service Card



Only HONITE Barrel Finishing Machines give you all these exclusive features

HONITE CHIP BIN. All-steel construction, extra-sturdy, extra-safe. Specially designed doors produce a simple, gravity-feed operation under any industrial conditions.

HONITE HOIST PAN. All-steel construction, available in two sizes. Especially designed for quicker, easier materials handling, it will stand up to long years of hard use.

MODERN, SAFE, simple to operate HONITE DV-5 and DV-3 Barrels (5 h.p. and 3 h.p.) are ruggedly constructed from the solid steel base up to guarantee a long service life. You save on maintenance costs because motors are housed in a splashproof case; electric switches are mounted in watertight compartments; wiring is factory installed and completely waterproof. These barrels are built to outlast and outperform any other model on the market today. For further information call your HONITE Field Engineer today, or send coupon below.

Honite® BRAND

Minnesota Mining and Mfg. Co.
Dept. PM-104, St. Paul 6, Minn.

☐ Send me FREE folders describing Honite equipment in detail.

☐ I'd like to talk to a HONITE Field Engineer.

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COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: London, Ont., Can. Export: 122 E. 42nd St., New York City. Makers of "Scotch" Pressure-Sensitive Tapes, "Scotch" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

3M COMPANY

For more information circle No. 79 on the Reader Service Card

bond 771, is neutral and contains no metallic activator. The absence of a metallic activator, according to the manufacturer, leaves the metal surface chemically clean and requires no surface seeding in the pre-phosphate coating stages. Subsequent phosphate coatings are extremely fine grained, uniformly coated and result in lower chemical consumption.

Detrex Corp.
For more information, circle No. 202 on the Reader Service Card

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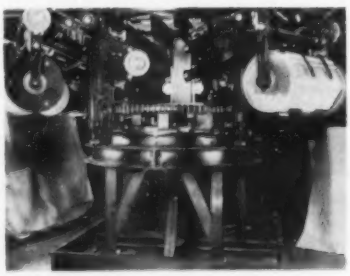
PLATING BARREL CONVEYOR . . . uses standard barrels



A new conveyor that uses standard plating barrels, horizontal type, has been announced.

On one machine using 24 barrels, 14 inches in diameter by 30 inches long (inside dimensions) a production rate of 3000 to 6000 lbs. of plated work per hour can be achieved. The production rate will, of course, depend on the surface to be plated, the thickness of the plate, etc. This production rate was achieved on a standard zinc cycle. The conveyor can be used on any standard plating cycle.

Extreme flexibility is an outstanding feature of the machine, according to the manufacturer. As an example, cylinders in cleaning and plating can operate at one speed, and cylinders in dichromating and subsequent tanks can operate at an entirely different speed. All cylinders are potentially capable of individual lowering or raising.

The Udylite Corp.
For more information, circle No. 205 on the Reader Service Card

Investment Casters Plan November Meeting

The second annual meeting of the Investment Casting Institute will be held November 3 and 4, 1954, at the Congress Hotel, Chicago. V. S. Lazzara of Casting Engineers, Inc., chairman of the Institute's program committee has announced that the November 3 session will be devoted entirely to Institute business, so that the second day, Thursday November 4th, can be reserved for a study of the technical details of producing investment castings.

The technical sessions will include talks and discussions by nationally known authorities on such topics as "Proper Gating, Sprueing and Risering", "Metal and Mold Temperatures", "Melting Techniques", "Heat Treatment", and "Investments".

The speakers will include representatives of such organizations as Armour Research Foundation, Battelle Memorial Institute, and Massachusetts Institute of Technology.

A part of the technical sessions will include a report from the I.C.I. Material Specifications Committee, Charles Yaker of Misco Precision Castings Co., chairman, and from the Inspection and Standard Quality Practice Committee, B. W. Duncan of Alloy Precision Casting Company, chairman.

The business session will feature a report on the recent conferences held with the U. S. Government Precision Casting Committee, and with the Castings Branch of the Business and Defense Service Administration of the Department of Commerce.

Other subjects to be discussed at the business session will be the results of the industry survey report in which every member of the Investment Casting Institute participated, and the election of officers and directors for the fiscal year 1954-55.

HYMAN GOLDBURG DIES; WAS P-K SALES DIRECTOR

Hyman Goldburg, director of sales and service of Parker-Kalon Division of General American Transportation Corporation, 200 Varick St., New York City, died September 1, 1954, after a short illness, at the age of 52.

He was a member of the Parker-Kalon management since shortly after the founding of the company, starting as an associate of his brother Louis in the Kalon Supply Company. In 1925 he became Treasurer of Parker-Kalon Corporation. Following the acquisition of Parker-Kalon Corporation by General American Transportation Corporation in 1953, Mr. Goldburg continued in the position of Director of Sales and Service.

THE MORE KNOW-HOW YOU PUT IN THE BARREL, THE MORE PROFIT YOU TAKE OUT

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

PRECLEANING—Good tank cleaning; Good barrel cleaning; Good rinsing saves money.

CUTTING DOWN, DEBURRING—Good solutions; Abrasive media, water and work ratios, etc.

PICKLING, DESCALING, BRIGHT DIPPING—Good solutions for steel, brass, aluminum, etc.

BURNISHING—Good solutions; Burnishing media, water and work ratios, etc.; How to overcome water hardness; How to keep barrels and media clean; How to prevent rusting, tarnishing and other corrosion.

FREE For your copy of "*May I put my head in your finishing barrel?*" just write or mail the coupon.

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For more information circle No. 81 on the Reader Service Card

develops
a new approach to
SURFACE FINISHING

ROTO-FINISH has now extended the original barrel finishing process to include entirely new special fixture machines and equipment. These machines represent a radically new departure from the generally accepted conception of barrel finishing machines, made possible only by Roto-Finish extensive experimental facilities and long experience with modern, precision surface finishing processes. And these new special fixture machines prove that there are no limits to the size or shape of parts which can be successfully processed with proper equipment, materials and methods.

The new engineering developments which have taken place in the Roto-Finish laboratories open the door wide to entirely new applications and entirely new principles in mechanical surface finishing. Therefore, whatever your finishing problem, we urge you to ship us two finished and several unfinished samples of parts you may wish to have us process in our laboratories. Remember, Roto-Finish guarantees the same result in your shop, as on the samples processed in their laboratories.

Get this new
FREE CIRCULAR

Roto-Finish COMPANY
3716 MILHAM ROAD, KALAMAZOO, MICH.
P. O. Box 988 — Phone 3-5578

It's the finish that counts

For more information circle No. 83 on the Reader Service Card

IMPROVED VISIBILITY
continued from page 37

surface is coated with a water-soluble wax.

Limited Quantities. Permanent mold seemed to be the best solution for the problem of getting a smooth surfaced piece in limited annual quantities. Annually, the production of these gages is measured in the hundreds, which would not permit expensive tooling.

The shape of the piece is not a difficult one to produce, although the thin walls gave some problem of metal flow along the sides of the casting at first. This has been overcome by the caster, the Eastern Casting Corp., Div. of Eastern Malleable Iron Co.

Features Incorporated. Instead of a separate, stamped name plate, as was used with the sand casting, it has now been possible to produce the name plate and trademark integrally with the casting because of the better detail permitted with permanent mold casting. This is a less expensive and more satisfactory manner of placing the identifying words on the instrument. After the entire casting is anodized, the surface of lettering is cleaned off with a hand file, revealing the white color of the base metal. This is a permanent and attractive finishing method.

Also included in the new castings are all mounting holes, formerly drilled in the sand castings.

This application of a permanent mold casting illustrates the way in which this type of casting can improve the appearance and quality of a product, even when intermediate quantities are needed. Without excessive tool costs, this company has obtained a smoother, lighter, better-looking, more accurate component for their instruments.

PISTON RINGS
continued from page 39

with a uniform distribution of graphite through it. The final metal has a density of about 6.5 g/cc, it is basically iron with minor alloying additions other than graphite. As produced at the present time, the material has a tensile strength in the order of 70,000 psi—about 40 to 50 percent higher than gray cast iron.

Elastic properties are about the same as cast iron, as are the elevated temperature creep properties, hardness is 90 Rockwell B. Machinability of the powdered iron rings is considered adequate although not as good as the machinability of cast iron.

The frictional properties of the powdered iron rings are not precisely known, but dynamometer tests show that the new rings are at least equal to, and possibly superior to, cast iron rings.

Cost factors

On the economic side factors appear to favor powder metallurgy as a fabricating method. Low cost iron powder can be used as the basic material. While some machining is, of course, required on the sintered rings the cost of this machining is far lower than for cast iron. The rings must be ground to the proper OD and thickness and the gap must be cut.

Scrap losses in manufacture are practically nil for powder metallurgy and, when the operation is properly controlled, the number of rejects after fabrication and machining is so low that it can be ignored for all practical purposes.

No impregnation of any sort is required on powdered iron rings. Initial tooling costs are moderate; higher, of course, than for casting but through the use of cemented carbide dies tool maintenance and replacement is so low that it does not add appreciably to the cost of the rings.

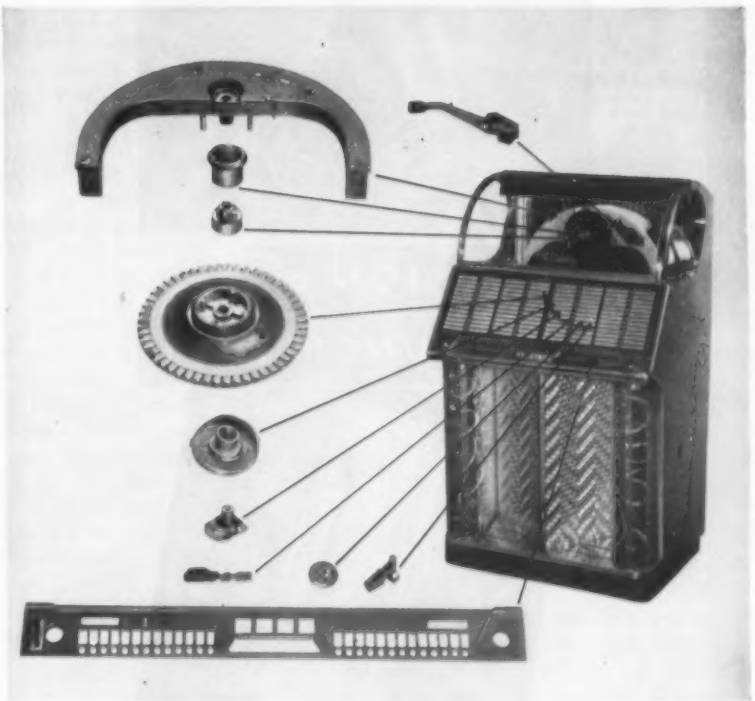
Through the use of powder metallurgy as a manufacturing method, inspection costs are drastically reduced. The piston ring industry was one of the first to utilize statistical quality control on a large scale. With this method of control as the number of rejects decreases there is a very great decrease in the cost of inspection. All of these factors add up to a better piston ring at lower costs.

Actual production costs are not available at the present time. It is known, however, that on smaller diameter rings for transmissions and small compressors and probably for small gasoline engines, the piston rings can be, and are being, produced at an appreciably lower cost than comparable rings in cast iron.

The larger rings, such as those required for the average automobile engine, can be produced at least as inexpensively and probably—when full scale production is achieved—at a lower

Continued next page

ACCURATE Aluminum, Zinc and Magnesium Die Castings help WURLITZER



...produce an outstanding high fidelity phonograph at lower cost

■ To help maintain its reputation for high quality products that are competitively priced, the Wurlitzer Co. specified ACCURATE die castings. They were sure that every die casting would meet every specification. Cast to close tolerances, these castings required little or no machining, are light in weight, and are ready to use as cast.

Whether it's aluminum, zinc or magnesium die castings, ACCURATE is completely set up to help you with your requirements.

Contact us today for prompt action.

Aluminum, Zinc and Magnesium Die Castings

ACCURATE DIE CASTING CO.
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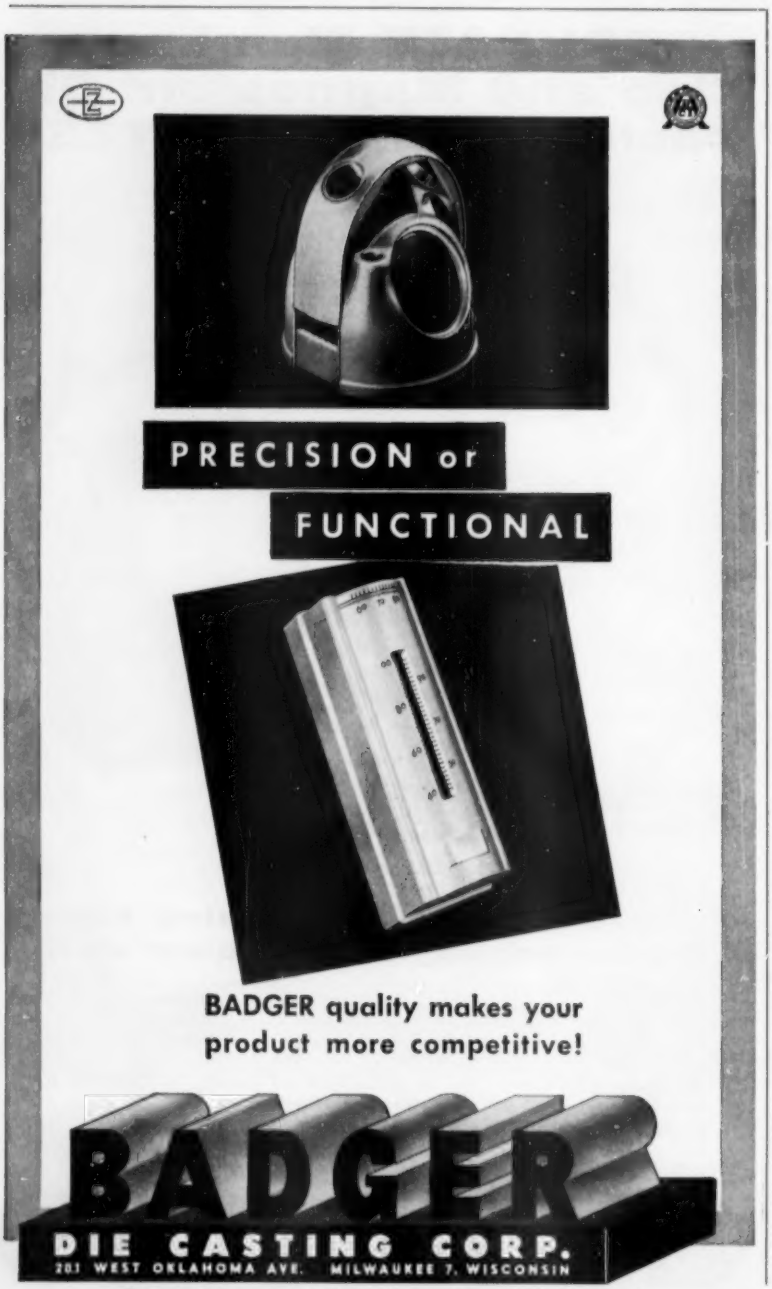
For more information circle No. 2 on the Reader Service Card

Piston Rings — cont.

manufacturing cost than cast iron rings.

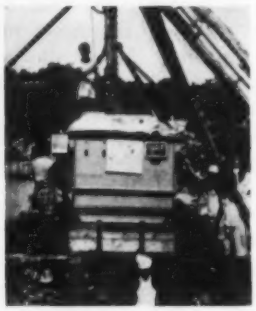
These production costs are based on duplication of present rings of minimum thickness of about 3/32 inch. When the thickness is reduced, as the engine manufacturers propose, then costs for the cast iron ring will inevitably skyrocket due to the excessively high number of rejects, while powder metallurgical costs should not increase and, due to the lower weight, may decrease.

There still remains the question of service life in an internal combustion engine. So far, Muskegon Piston Ring Co. has had some 75,000 miles of service with no greater wear than is normally found on existing cast rings. Test work is still going on by the company and when rings are released to automobile manufacturers further testing will have to be done. This adds up to at least another year before a powdered iron ring will appear in a car. Possibly longer.



For more information circle No. 18 on the Reader Service Card

BOUND FOR INDIA . . .



A 47,000 lb. low-frequency induction furnace is shown being unloaded in Cochin, India, for shipment to Aluminum Industries, Ltd. of Kundara. The furnace, made by Ajax Engineering Corp. of Trenton, N. J., will be used for melting high purity aluminum for the manufacture of overhead power cables.

PRODUCE NICKEL POWDER

Eldon L. Brown, president and managing director of Sherritt Gordon Mines Limited, has announced to stockholders that pure nickel powder and by-product ammonium sulfate are now being produced in commercial quantities using a new entirely chemical process.

The plant which embodies the new process is expected to reach rated capacity sometime in the fourth quarter.

"The startup of the plant followed the pattern established in our Ottawa pilot plant," Mr. Brown said. "No troubles were encountered with the process, which has been working exactly as the pilot plant operation indicated it should. The nickel metal produced has been right up to specification since the start of production July 22."

The firm's mine at Lynn Lake, Mr. Brown added, "is currently producing nickel concentrate at a rate considerably in excess of our estimates."

Industry News

Companies · Plants · Associations

ASME AWARDS MEDAL FOR PAPER ON CAR WHEELS CAST IN PERMANENT MOLDS

E. Q. Sylvester, executive vice president, Griffin Wheel Company, Chicago, Ill., has been named to receive the Melville Prize Medal.

The ward, which is administered by the Board on Honors of The American Society of Mechanical Engineers, is conferred annually for the best original paper on a mechanical engineering subject presented for discussion and publication to the Society.

Mr. Sylvester's paper, "Pressure Pouring Steel Car Wheels in Permanent Molds," was presented before a joint session of the ASME Railroad Division, the ASME Research Committee on Metal Processing, and the American Society for Testing Materials at the 1953 Annual Meeting of the ASME in New York City.

Mr. Sylvester is a graduate of Massachusetts Institute of Technology. He has been with the Griffin Wheel Company, manufacturers of freight car wheels, steel and chilled iron, since 1940. In addition to writing a chapter on the "Fatigue of Metals" in the book, "Engineering Opportunities," he also holds a number of patents on methods of manufacturing railway car wheels.

The Melville Prize Medal was established in 1927 to recognize the contributions of George Wallace Melville to the profession of engineering. Rear Admiral Melville was the first chief of the Bureau of Steam Engineering in the Navy. His hazardous Arctic expeditions are a matter of common, though thrilling, knowledge.

WAIMET ENGINEERING TO SELL ALLOYS FOR MICHIGAN STEEL

Roger Waindle has extended his WaiMet Engineering Company which specializes in metallurgical and methods consulting, to include national representation on sales and technical service for the new line of RxMet Master Remelt Alloys now being produced by Michigan Steel Casting Co.

WaiMet has been retained by Michigan Steel in connection with their new installation of production facilities for these alloys. WaiMet's main office will be with Michigan Steel at 1999 Guoin St., Detroit 7, Mich. Eastern office will be operated by M. G. Whitfield, metallurgical consultant, 2 Harvard St., Garden City, N. Y.

ATOMIC DIE CASTING CORP. OPENS IN CHICAGO

Henry A. Kleifgen has announced the opening of a new die casting company known as the Atomic Die Casting Corporation located at 7817 South Claremont Avenue, Chicago 20, Ill. The plant facilities are completely new with the latest type of machinery and equipment to handle all types of aluminum, magnesium and zinc castings.

Henry Kleifgen and his brother, William J. Kleifgen, who is associated in this new business, have had 25 years of die casting experience.

JOHN HALLER FORMS NEW PRESS COMPANY

John Haller, formerly vice president in charge of research and engineering at Allied Products Corporation in Detroit, has now organized Haller-Incorporated in Plymouth, Mich.

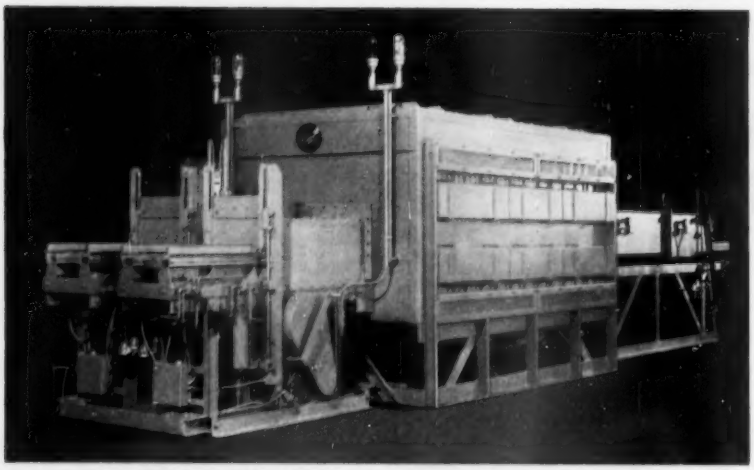
The new firm will handle sales and engineering connected with

John Haller

hydraulic and mechanical presses for powdered metal, pharmaceutical, chemical, and plastic processing. In addition to sizing and tabletting presses of Mr. Haller's design, the firm will import several lines of European presses and other processing equipment.

MERCAST CORP. FORMS NEW BRITISH FIRM

Admiral Alan G. Kirk, chairman of the board of the Mercast Corp., New York, has announced that this company and Guest, Keen and Nettlefolds Ltd., London, England, have jointly formed a British company, Mercast (Great Britain) Limited, to license the use of the Mercast process to firms in the United Kingdom and the British Com-



Harper Electric Double Muffle Pusher Furnace

FROM METAL POWDERS to METAL PARTS

...an EASY OPERATION with MODERN HARPER ELECTRIC FURNACES

BOX

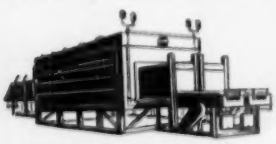
BELL

ELEVATOR

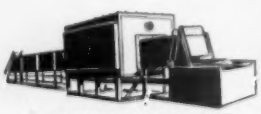
● If you want continuous production sintering with its many savings in machining, look into *The Harper Way*. As qualified specialists in heat processing of powder metals, Harper engineered furnaces add production and materials handling savings to the basic economies of powder metallurgy.

Uniform heat distribution and automatic temperature regulation for accurate sizing of product...sequence and timing of heating and cooling cycle synchronized for integration with conveyorized production lines...one man operation...minimum floor space,—those are typical Harper design features.

Find out how Harper specialized experience can help you by writing an outline of your problem.



TWIN AND SINGLE MUFFLE PUSHER



CONTINUOUS MESH BELT CONVEYOR

STRAND ANNEALING

Furnace Builders Harper *for over 30 Years*

See the Harper Furnace Exhibit at the Metal Show in Chicago
Booth 1919

HARPER
Electric Furnace Corp.
41 RIVER ST., BUFFALO 2, N. Y.

For more information circle No. 34 on the Reader Service Card

monwealth (excluding Canada).

The process, already gaining wide application in the United States, utilizes frozen mercury to form the expendable patterns for producing parts by the investment casting process. Since its development several years ago, it has enabled the precision casting of larger and more complex parts than were theretofore possible.

Important uses for the process include components for the aviation industry and for atomic energy work. In addition, such parts as turbine blades, wave guides, pneumatic piston components, locking and hatch devices, generator and motor brackets, impellers, glass mold dies and many other products have been successfully produced by the process.

American licensees include Alloy Precision Castings Company, Kolcast Industries, Inc., and Thompson Products, Inc., all of Cleveland.

American directors of the new British firm include in addition to Admiral Kirk, S. J. Sindeband, president of Mercast. The chairman of the new company and other directors represent British interests.

HARRISON BECOMES SINTERCAST ASSOCIATE

Erwin Loewy, president of the Sintercast Corporation of America, has announced the appointment of recently retired Navy Captain Robert E. W. Harrison as Director of special engineering projects.

Harrison will aid in the development of refractory carbides and powder metal parts and direct their application to industrial and military uses in which wear and heat resistance are now major problems.

Harrison has more than 40 years of engineering experience. He holds numerous patents on industrial mechanisms and processes. He is the author of a wide range of papers on technical and management subjects presented to engineering societies in the United States and Europe.

MPA MEETING
continued from page 56

tive capacity' for all except the quantity needed to meet an immediate impact of any military action. That effective capacity is being provided by the stand-by and lay-away programs, the cooperative response to which, on the part of industry, has been truly inspiring." He went on to explain that, "during the operation of this plan the essential key plants required to produce the most important military products are kept running at minimum operating rates so long as requirements justify, and are then held intact in standby under the control of the contractor."

NEW ALUMINUM ALLOY

A new aluminum alloy for conducting electricity, No. 2EC, has been developed by Aluminum Company of America.

This new alloy is a tailor-made

For more information circle No. 63 on the Reader Service Card

STROH

SOMETHING TO CROW ABOUT

Has Been Producing Excellent ZINC DIE CASTINGS Since 1903

We are a bit proud of the fact that numerous of our customers are in the third generation.

"Teddy" Roosevelt was president of the United States when STROH first produced zinc die castings. The fact that we still serve many of these early accounts, we believe, speaks volumes for the excellence of our product.

Inquiries Invited:

STROH DIE MOULDED CASTING CO.
525 East Michigan St., Milwaukee 2, Wisconsin

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Are you receiving our monthly house organ—THE HENNING MESSENGER? We know you'll get a kick out of the contents and suggest you ask to be placed on our mailing list.

Zamak (Zinc Base) Die Casting Alloys

If you aim to use the finest alloys on the market without paying any premium for Quality — select H. B. & S. For more than 35 years our product has been first choice of discriminating buyers. Shipments made speedily by truck or in car load lots from our own private railroad siding. Certified analysis accompanies each shipment.

Our alloys meet all Government, ASTM and SAE specifications.

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91-113 Scott Avenue • Brooklyn 37, N. Y.
"DEPENDABLE SERVICE SINCE 1922"

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Need pounds or tons of

Custom-made Alloys for remelt or reprocessing?

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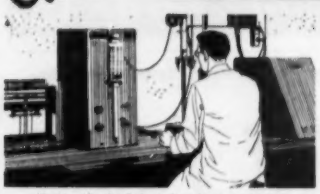
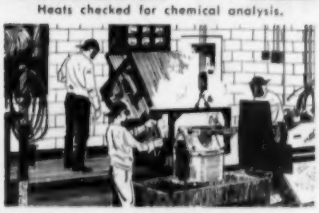


Heats checked for chemical analysis.



Carried in stock are supplies of the 300 and 400 stainless steels as well as carbon alloys. "Specials" including electronic and aeronautical type alloys, tool steels, ferritic, austenitic and super stainless alloys of nickel- and cobalt-base. Available in shot, ingot, billet or cast bars.

Exactly predictable metallurgical control of finished casting is assured by MasterMet control of high-temp alloys, tool, stainless, and carbon steels

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material developed to meet the high performance requirements of the electrical equipment manufacturing industry.

No. 2EC aluminum conductor alloy has superior mechanical properties, with a slight sacrifice in electrical conductivity over other aluminum alloys used for conductor purposes. Such properties are especially important for applications requiring high yield strength and low creep.

OPPORTUNITIES

SALES REPRESENTATIVES with related lines wanted for Illinois, Missouri, Iowa, Southwest Michigan by Chicago aluminum and zinc die casting firm. Give full details. Inquiries confidential — will be answered promptly. Write Box 10154, PRECISION METAL MOLDING magazine.

DIE CASTING DIE DESIGNER AND ENGINEER: Long established, medium sized die casting manufacturer has opening that offers unusual opportunity to an engineer, age 30-40, with experience in the design of die casting dies and tools for the production of high pressure zinc and aluminum die castings. Modern plant and equipment — Location Midwest. Give age, education, past experience, remuneration, etc. All information kept strictly confidential. Write Box 10254, PRECISION METAL MOLDING magazine.

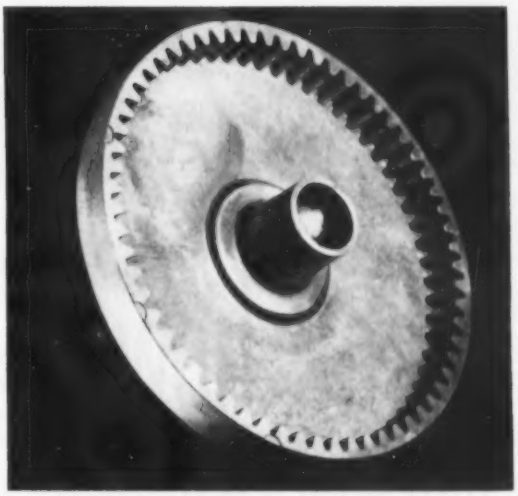
WANTED — DIE CASTING FOREMAN — to work for a well known die casting company in metropolitan New York area. Must be experienced in zinc and aluminum alloy die castings. Excellent opportunity for the right man. Write giving experience, salary requirements. Write Box 10354, PRECISION METAL MOLDING magazine.

FOR SALE: Small plant located in middle west. Die casting and finishing. Write Box 10454, PRECISION METAL MOLDING magazine.

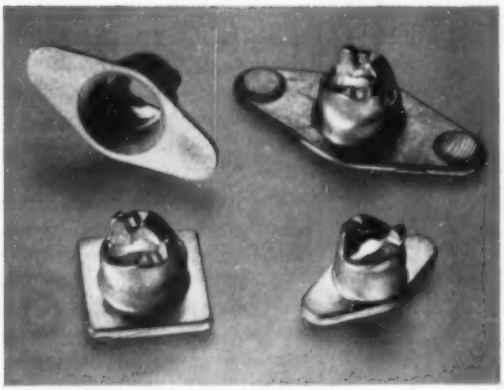
FOR SALE: Kux 500 Ton HP-35 aluminum die casting machine used approximately six months. Write or Call: J. G. Gokey, Structo Manufacturing Co., Freeport, Illinois, Phone: Main 4200.

DIE CASTING MACHINE FOR SALE: Kux BA-12 80 ton zinc, 12 x 12 Die Space, Complete Electric Accessories, Price $4500. Chicago White Metal Products, Inc., 5239 W. Grand Ave., Chicago.

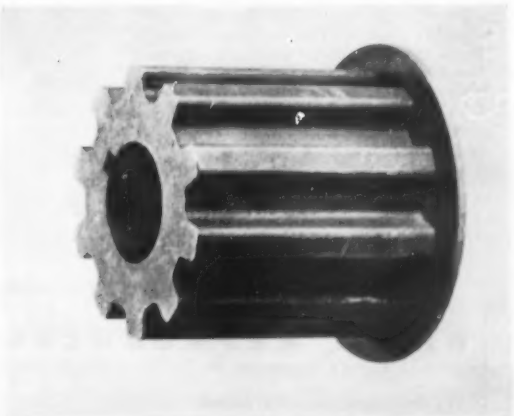
Simplified Solutions for product design problems



WHERE DIE CAST MAGNESIUM is doing a better job than sand cast iron can be seen in the lawn mower gear, right. The die casting, produced by Litemetal Dicast, Inc., makes good use of the small draft permitted by the use of magnesium and thereby, gains good tooth contact. The cost is considerably less than cast iron, while the service life is extended. Annual quantities on this piece are about 350,000.



DIE CAST BRASS has replaced an assembly of two forgings for these receptacle fasteners, produced in quantities of about 3½ million per year. The die castings are less expensive and have better wear resistance. They are produced by Doehler-Jarvis Div., National Lead Co.



GEAR BELT DRIVE gear is now being produced from powdered iron by Kwikset Locks' Powdered Metal Division, for Magna Engineering. Used on a home workshop machine, it is less expensive than a machined gear by $1.72, has good tooth form and high strength.

PATENTS
continued from page 48

progress of science and the useful arts for the benefit of the public. Every inventor has the difficult task of showing that his invention meets the technical requirements of patentability. He must not only convince the Patent Office of the patentability of his invention, but also must stand ready to support the validity of his patent when he sues an infringer.

The Constitution of the United States does not authorize the protection of trademarks as it does that of patents and copyrights and for this reason, a trademark is sometimes referred to as an "orphan" in the law. In a trademark, it is its adoption and use on the goods in commerce that create the rights which the courts protect. The continued use of a trademark by its owner is essential to its validity and right to exclusive ownership.

Ownership of a trademark is a common-law property right founded principally upon the basic concept of unfair competition and the general equitable principles governing such practices. Throughout the years, the courts have enunciated sound equitable principles for the protection of trademarks and now many of these principles have been incorporated and codified into the new trademark law which affords more direct and effective redress against unlawful use. The best way to obtain effective redress against unlawful use of a trademark is to register it in the U. S. Patent Office.

The Patent Office serves as a kind of clearing house for the prevention of duplication in trademarks. All registered trademarks are placed on file and open to public inspection. An interested party may, by making a search of the records, avoid the adoption of a trademark already adopted by another.

An important advantage of a trademark registration is that it entitles the owner of a trademark to mark his product with the notice: "Reg. U.S. Pat. Off.", or just the letter "R" enclosed in a circle, thus ®.

Legal Notice

Compliance with the marking statute constitutes legal notice to the public that the owner has registered the mark and claims its rightful ownership. It is important for all such registered marks to carry this notice for the reason that the trademark laws provide that it is the duty of the registrant to give the public notice of the fact that the trademark is registered. Failure to include this notice with the trademark prevents the recovery of damages for past infringement, except on proof that the defendant was directly notified of infringement and continued the same even after such notice was given.

The subject of copyrights is directed primarily to the finer arts, which are afforded protec-

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tion against copying by others. A partial list of copyrightable material may include books, periodicals, catalogs, lectures, sermons, musical compositions, works of art, models or designs for works of art, maps, photographs, commercial prints and labels, and motion pictures other than photoplays. Copyrights are not to be confused with trademarks, which merely protect an identifying mark or symbol.

A question which arises in this connection has to do with slogans. As a general rule, a slogan cannot be protected by either a trademark registration or a copyright registration. However, if the slogan is used in a trademark sense, it may be allowed the protection of a trademark registration. "Be Sure With Pure" gasoline is an example of a slogan used in a trademark sense which has been granted protection by the Patent Office.

A person desiring to apply for a copyright registration may write to the Register of Copyrights, Library of Congress, Washington, D. C., for information and for the proper copyright form for the particular material for which he wishes to register a copyright. This service, including the information and the copyright form, is free of charge.

As stated before, material which is to be registered as a copyright must *first* be published and must bear the notice of copyright. "Copyright (year) by (name of copyright proprietor)" is a proper copyright notice. After the material has been published with the copyright notice appearing thereon, a copyright registration may then be obtained by filing an application with the Copyright Office.

General Misconception

There is a general misconception that the copyright proprietor has no legal right to apply this notice of copyright upon his material to be registered until he has obtained the copyright registration. This assumption is incorrect. It is a legal require-

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UNIVERSAL Castings patented method of low temperature pouring produces a material having a much denser structure than castings produced by ordinary methods. The unusually high strength developed in this material has caused it to be in great demand for use in Aircraft fuel pump impellers, torque convertor wheels, air compressor impellers, and many other highly stressed casting applications. Accurate detail and sections 1/32" thick can be produced consistently.

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Patents — cont.

ment that the notice of copyright be printed upon the material to be copyrighted as of its first publication and before mailing it to the Copyright Office. Unfortunately, when copies have once been published without the copyright notice, there is no legal way of securing a registered copyright for the work. Even the addition of a subsequent publication bearing the correct copyright notice will not cure the defect of a prior publication without such notice.

Rights of Inventors

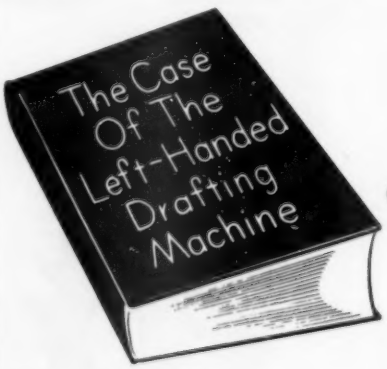
It should be remembered that the incentive to create for the promotion of industrial progress is greatly stimulated by the assurance that the thing created can be protected as a valuable property right. This protection of the property rights of inventors is fundamental to our industrial growth. In recognition of this fact, the law has characterized patents, trademarks and copyrights as industrial property, which is the source of our greatest wealth. As in the past, the power to invent and create new things will control the future. The extent to which industrial property may grow, though it is beyond our ability to comprehend its vastness, will be proportional to the degree of protection afforded by the laws, and to this extent an even greater emphasis will be placed upon patents, trademarks and copyrights.

From the flow of ideas which are protected and made practical by patents, trademarks and copyrights come better living, a stronger nation, freedom and jobs.

J. M. DOLAN JOINS SOLAR

John M. Dolan has been named to the newly created post of vice president-sales of Solar Aircraft Co., Edmund T. Price, president and general manager, has announced.

Since January 1949, Dolan has been vice president, general sales manager and director of The Hydraulic Press Manufacturing Company, of Mount Gilead, Ohio.



or . . .

How To Get Precision Castings In Short Runs

Most draftsmen, being right-handed, require a drafting machine that puts the scale edge in proper relation to the right hand. Since the large chuck arm is the key to this relationship, it must be accurate and durable. The Universal Drafting Machine Corp. Cleveland, Ohio, therefore designed this precision component for its machine as a casting. Precision plus large quantity made it a natural for die casting. BUT . . . what about the relatively few demands for left-handed machines? Quantity was much too small to make die casting worthwhile. Hale engineers supplied the answer: **cast the components for the left-handed machines in plaster molds.**

Plaster mold casting offers high precision in non-ferrous parts at tooling costs not much higher than for sand castings.

If your requirements, like Universal Drafting Machine's, are for precision parts in limited quantities — or if you want pilot runs on components that will eventually be die cast — look to Hale Foundry Co. for fine plaster mold castings.

There is an equation with which you can determine the exact quantity level at which a part can most economically be cast in plaster molds. We'll be happy to show this equation to you. Just ask us.

For precision in limited production and pilot run parts, call on

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New Plant Describes

Method Of Producing Iron Powder

How is iron ore converted to iron powder of closely controlled analysis? Few engineers are familiar with the process.

At the completion of one year of operation, the Hoeganaes Sponge Iron Corp., has furnished a description of the process employed at its Riverton, N. J., plant, for the production of sponge iron powders for powder metallurgy, welding rod coatings and various other uses.

The process used at Riverton to produce Ancor 80 iron powder, developed to replace the imported Swedish grade MH-100 produced by the parent company, yields a powder of chemical analysis as follows:

H_2 loss	%	.8 max
C	%	.10 max
SiO_2	%	.10 max
S	%	.020 max
P	%	.010 max
Fe_{tot}	%	97.5 - 98.5

The Hoeganaes process, one of several methods for producing iron powder, follows the same principles as used by the parent company, but has been streamlined with modern equipment to cut labor requirements in order to supply a high quality, inexpensive iron powder. Ancor 80 is said by the manufacturer to produce parts having 30 percent greater green and also sintered strength compared with those made of MH-100.

A flow chart to illustrate the process is shown, Figure 1. The steps in the process follow.

Presently high-grade Swedish iron ore concentrate is imported containing 71% iron, but successful production runs have been made with domestic and other ores, in some cases resulting in an improved iron powder quality. Other raw materials such as coke breeze, limestone and propane are obtained nearby.

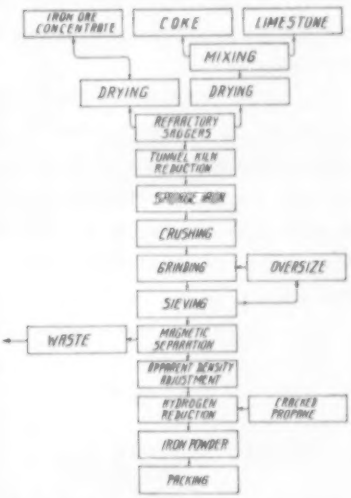
Drying of ore, coke and limestone is done in two 30 foot long oil fired rotary driers. Equipment is also provided for adjustments of screen analysis if so required, before the materials are stored for further treatment.

Reduction of the ore is done in two steps, although more than 95% of the oxygen in the ore is removed in the primary step in a tunnel kiln 570 feet long with a cross-section area of approximately 55 square feet. Heat is provided from 72 gas-fired burners, arranged in four groups, with automatic temperature control for each group.

The iron ore is charged by a machine together with the coke and limestone into refractory saggers which are stationary on the kiln car bottoms. During the reduction, the iron sinters to cakes which, after firing, are discharged from the cars in a semi-automatic discharging station. Each car yields twenty 6 foot long sponge iron cakes.

Crushing and grinding is done in three steps in connection with screening, providing for a close control on screen analysis. Several magnetic separation steps are included for purification, as well as an "apparent density" adjustment. In a separate milling operation density is increased from around 2.10 g/cc to 2.30 g/cc, without any substantial changes in the screen analysis.

On the resulting raw powder one important step remains before it becomes suitable for powder metallurgical use; i.e., the annealing process. Thereby, the compressibility of the powder is greatly improved by removal of cold work and oxides. This is done in continuous 120 ft. long gas-fired muffle furnaces using hydrogen as a reducing agent and protective atmosphere. Hydrogen is supplied from separate units utilizing the method of cracking propane with steam.



1. FLOW CHART shows steps in process of reducing iron ore and producing iron powder.

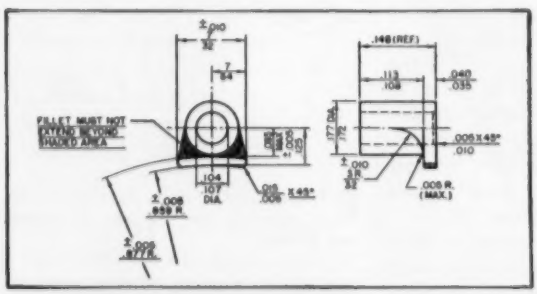
2. TUNNEL KILN 570 feet long removes more than 95 percent of the oxygen from the ore.

BIG SAVINGS IN LITTLE PARTS

BY SWITCHING TO NICKEL SILVER POWDER

The 4 sizes of aircraft remote reading instrument clamps pictured above were formerly machined from aluminum bar stock. They are now pressed from nickel silver powder by Chrysler Corporation—Amplex Division, thereby achieving *a saving of approximately 60 cents per reading instrument.*

The former production method involved 6 screw machine and punch press operations. Powder metallurgy reduced the operations to 2 and provided the shear strength required to withstand stress on the clamp flanges when attached to the instruments with screws. The selection of nickel silver powder assured corrosion resistance.



To provide designers, engineers and metallurgists with a concise reference to the factors which should be considered in designing for powder metallurgy, we—the makers of Horse Head metal powders—have published a 32-page handbook FACTS ABOUT PRESSED BRASS and other nonferrous POWDER PARTS. Ask us for a copy.

THE NEW JERSEY ZINC COMPANY
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METAL SHOW HIGHLIGHTS YEAR'S METAL ACTIVITIES

The 50,000 visitors who are expected to attend this year's National Metal Show in Chicago November 1-5 will divide their attention between the large show at International Amphitheater and many technical papers delivered before the National Metal Congress during the same week.

Both activities, sponsored by the American Society for Metals, will keep a constant interest for the technical men who will attend. In all, 442 exhibitors will display their wares for the metals industry at the show, and 39 papers of widely varying content will occupy the Congress sessions.

Every phase of metal producing, forming and processing will be represented in the show. Materials, equipment and processes will be on display, and should create the nucleus for many a new industrial operation.

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SAVE ON MACHINING
continued from page 41

part to the same stage of completion as the as-cast condition of an investment casting. In the housing illustrated, expensive tooling was fully justified on this basis.

When tooling costs are equal, there is always a per piece saving since labor charges in investment casting foundries are lower than labor costs for machinists and the saving that is realized comes about by this difference in wages. Obviously, when the investment casting tooling is less expensive than the total tooling for other methods, there is an additional saving.

Three other investment castings are illustrated in Figure 4. Two of these are cast in 356-T6 aluminum.

The cradle, Figure 4a, has most of its surfaces finished to at least 63 micro-inches and in some cases as low a roughness level as 32 micro-inches. This high degree of surface finish requires that the castings be absolutely sound, smooth and free of sand inclusions, blow-holes, etc. Prior to any machining, these castings are

Continued next page

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LIGHTNESS of WEIGHT is ESSENTIAL for PORTABLE TOOLS

Many Manufacturers Have Solved Their Needs for Making Tools REALLY Portable by Using Magnesium or Aluminum Die Castings.

Not only do magnesium and aluminum die castings greatly reduce weight but their toughness and mechanical strength are adequate for the vigorous use to which they are put in such products as portable tools. Furthermore, the great reductions in weight that these lightweight alloys effect reduce working fatigue — thus increasing productivity in the use of these tools.

The photograph illustrates Chain Saw parts die cast from aluminum and magnesium. They are all typical applications and include: 1. and 2. Drive Pulleys, 3. Cylinder Head, 4. and 5. Blower Housing, 6. Handle, 7. Gas Tank Cover. Components such as these have, when die cast, offered greater scope to the designer, and to the manufacturer, important savings through the virtual elimination of machining, finishing and assembling.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

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LITEMETAL DICAST, Inc.

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PLANT AND EXECUTIVE OFFICES

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Save On Machining — cont.

100 percent X-ray inspected. In addition to showing a cost saving over other methods of manufacture, an investment cast cradle has far fewer rejects due to internal porosity than a part made by any other casting process.

In order to give adequate stock for surface finishing and to be certain that stock to maintain proper angular and parallel alignment is present, the casting tolerances have been opened to ± 0.030, an unusually open tolerance for an investment casting.

The eyepiece, Figure 4b, has, as a basic requirement, lightness in weight; it also is cast in 356-T6 aluminum. To cut the weight as much as possible, two openings are provided, one on each side of the base mount. Location of these openings is such that they can not be cored except at excessively high cost and at the risk of loss of roundness. By casting them with a very thin wall, the residual metal is easily and quickly removed by machining, at low cost and with little material loss. Both labor and material costs would be far higher by another fabricating method.

The final casting illustrated, Figure 4c, is a silicon bronze eyepiece. In this piece, thin wall sections are essential. The wall thickness where indicated by the arrow is cast 0.020 thick. Two ribs must be cast on the sides to give the part adequate rigidity during the casting operation and are later removed in machining. This necessity of removing the rib is not an extra operation, however, since a milling operation had to be performed at these places and the presence of the rib means removal of only a slight amount of extra metal, thus the only addition expense is in the small of metal lost in machining.

DIE CAST SHEARS

continued from page 36

member made substantially hollow with minimal ribbing to give necessary rigidity.

As die cast and trimmed, these two handle members are complete. In some cases, a slight amount of flash at the parting line must still be removed by light sanding, a minor operation.

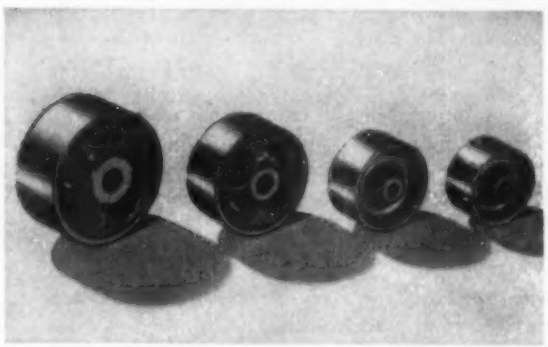
Where bearings and pins are needed the cored holes are close enough to size that no additional machining is needed; a light interference on a knurled surface will hold pressed-in inserts.

As far as the two handles are concerned, assembly and surface finishing are the only operations that must be done. Ease of surface finish-

ing is another important factor that favors die castings. As noted before, the castings are received with smooth surfaces and substantially all flash trimmed off. Following a light sanding at the parting line the casting is ready for painting. A chromate or phosphate treatment is applied to furnish a good paint bond followed by a baked enamel finish.

This finish is durable and will, with normal care, last the life of the tool. However, this type of tool is subject to all manner of abuse so that it is highly probable that during use the enamel finish will be scratched or broken. Were the handles of steel, corrosion could and would start at such breaks in the finish and would then progress under the painted surface. The result would be failure of the tools due to rusting long before the normally expected life. Because the handles are of aluminum, any break in the enamel has no effect other than to detract from the appearance. Wherever the base metal is exposed a film of aluminum oxide will form and immediately seal the surface so that no further oxidation can occur.

The life, then, of a pair of grass shears with die cast aluminum handles is entirely dependent upon the life of other components which, with only minimum care, can mean a great many years of satisfactory service.



Low-cost sintered metal wheels

Bassick's 10 years in powder metallurgy plus newly doubled plant capacity work together to give you sintered metal wheels and rollers (other intricate parts, too) for only 3¢ to 30¢ each, depending on size, quantity, and metal requirement. Equal to machined parts in mechanical strength, physical properties.

Write The Bassick Company, Powder Metal Division, Bridgeport 2, Conn., for Bulletin SM-54.

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TECHNICAL REPORT

The Influence of Metal Structure On Properties of Investment Castings

By DR. NICHOLAS J. GRANT, Department of Metallurgy
Massachusetts Institute of Technology

Part 2

The Value of Hot Molds

One of the important things to remember is that, as investment casters, you have a big advantage over the ordinary foundryman in that you do have available a hot mold. Now, the hot mold isn't there for only one reason, it is there for many reasons.

One of these is simply the fact that by heating the mold, you take advantage of the inversion or transformation which occurs in quartz, and as a result, you get a volumetric expansion of one or more percent in the mold. This is the factor which gives, to a great extent, the precision in the lost wax process.

The second reason for having a hot mold is that it helps to fill out fine details in the casting. It permits you to run thin sections and to fill them out in sharp detail.

But one of the advantages that many of you have not looked at in an important way, and possibly one of the most important, is that the hot mold gives much greater leeway in the selection of mold and metal temperatures in order to obtain desired metallic structures. In other words, if he has to run a thin section 12 inches long, the foundryman has to superheat his metal, as it runs through the cold mold. His main object is to fill that mold.

The metal coming in first is not coming with as much heat due to heat losses, whereas the last metal in the mold is the hottest. Because of this, one obtains different structures, grain size and properties in different parts of the casting.

In precision casting, a hot mold permits the use of much lower pouring temperatures than can be tolerated in standard foundry practice. For this reason, it means that you have rather good conditions for structure and grain size control. This is one of the important control items in investment casting of which many people possibly have not taken full advantage.

Are there other important reasons why, when the occasion demands, we should use pouring and mold preheat conditions that give a fine grain size?

Yes, there are a number of them. One, this results in lower gas solubility. That is, if you can pour with a metal temperature 100 or 150 degrees colder than usual, you are not going to dissolve as much of all types of gases, oxygen, hydrogen, nitrogen. Gas solubility is a function of the pouring temperature.

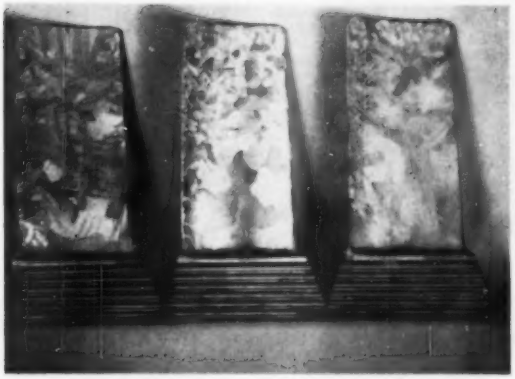
Lower temperatures permit better deoxidation; you get better efficiency in your deoxidation practice. There is also less danger of bringing in or promoting slagging reactions.

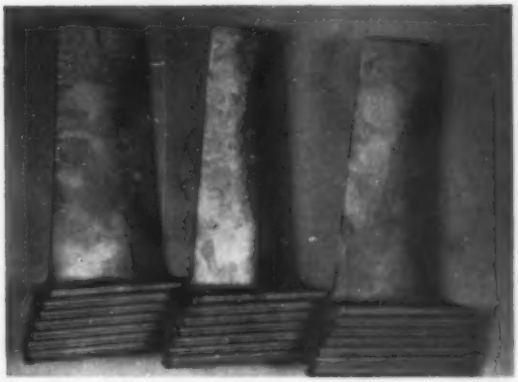
And finally, of course, there is less danger of alloy segregation. For example, in pouring a tool steel, carbide segregation is a very important factor to keep in mind. If you can solidify rapidly to get a fine grain size, you will also get a better distribution of the carbides.

All of these are reasons for pouring at the lowest possible temperature which will still permit complete mold fill-out and achieve the fine detail needed in the casting.

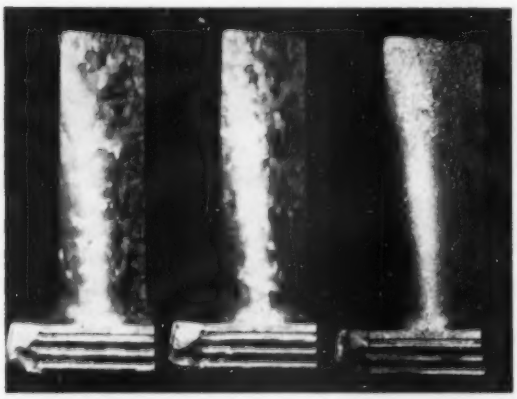
I have talked rather freely of grain size control; the big question is, can one actually control grain size? Consider some examples. The first one is a blade which came out of a jet engine back around 1945 or '46, back at a time when people were only apparently concerned in getting a decent surface, radiographic soundness, and, of course, dimensional control.

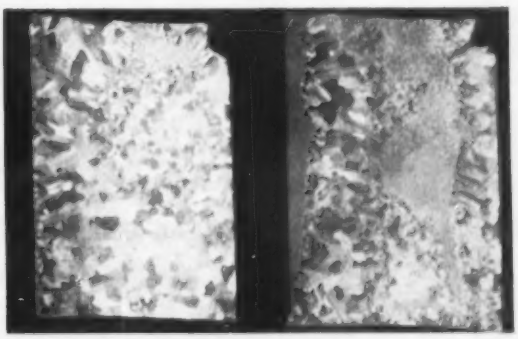
This bucket is etched. It shows that there is a grain on the front side, and a second one on the back side, each of which is about 3 to 4 inches long! On the trailing edge of the bucket, on the other





GRAIN SIZE VARIATION when casting conditions are not carefully controlled is illustrated above. Left is the front view and right, rear view, of blades referred to as blades No. 1 & 2 in text. Some of the grains are over three inches long, while others can hardly be seen in the same blade.





MEDIUM GRAIN SIZE controlled castings, left, and fine grain size controlled casting, right, showing reproductibility of structure throughout the section. Two blades at left are No. 3 & 4, while blade at right is No. 5.

BLADE No. 6 (left) shows fairly uniform grain structure with adequate gating, while blade No. 7 (right) shows grain structure with improper or inadequate gating which resulted in severly banded structure.

hand, the grain size is so fine it can hardly be resolved with the naked eye. This blade wasn't taken out of the jet engine because it fractured, it simply warped out of shape due to the differential elongation of the fine grained portion as compared to the coarse grained portion. Thus, the uniformity of the structure was an important factor in the performance, or lack of it, in this precision casting.

Now, bucket No. 2 is exactly the same type as bucket No. 1, but was cast to obtain a uniform, medium grain size throughout. This bucket should give better performance, more reproducable performance, during application. It also shows that one can get rather uniform grain size throughout a section of this type or size in spite of the fact that the cross-section changes quite markedly (from .030 to .550) and the length of the blade is fairly long (6 inches).

Buckets Nos. 3 and 4 are of a totally different size, and the trailing edge is much finer than it is in the heavy J-33 blades just examined. You will notice again that we get in both instances a very, very uniform grain size, even at the very thin (0.020 inches) trailing edge.

The fifth bucket in this group is a much finer grained casting (grains are 1 to 2 mm in diameter).

The fine grain sizes are very easy to reproduce by simply controlling the casting conditions. We have cast several hundred of these blades to specified grain size and have had several hundred more cast by the Engineered Precision Casting Co. We feel this can be done commercially if required.

Now, the big question comes up, are gating and spruing and such other factors important in structure and property control? The answer is, they are — because if the metal comes into the mold slowly it is going to make a difference in the temperature change that the metal undergoes in going from one section of the

Continued next page

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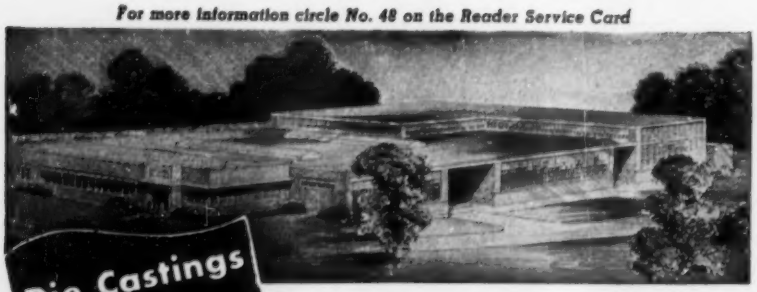

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Properties Of Investment Castings — cont.

casting to some other section. The metal must get in as quickly as possible so that it enters at about the same temperature everywhere. You want to get it in fast, so that even the casting method may make a difference if property control is important.

Please don't misunderstand — I am not saying that every casting has to have structure and grain size control, but if new products and new fields are to be opened, structure and property control will become more important. Where shape or surface finish or dimensional control is the sole factor, one simply selects the lowest safe pouring conditions which will result in a salable product.

I have two more buckets here which are very interesting because of the effect that gating and spruing had on the structure and performance of these blades.

The first of these, No. 6, shows a reasonably uniform grain size. It is better than bucket No. 7 which was gated in a particular way. We won't go into the precise details of how it was gated, except that it was gated through fairly small openings, two on the trailing edge and two on the leading edge. The etched structure shows that the metal entered the casting cavity through the four gates in a very non-uniform manner. This resulted in two distinct bands of grains, the one along the center of the bucket and on most of the trailing edge being a superfine grain size while the balance of the bucket is very coarse grained, especially at the gates into the bucket.

The hot thermal shock tests on this type of casting were not only poor but highly erratic. By changing the gating on this bucket, by changing the spruing and by centrifugally casting, we were able to eliminate the undesirable duplex structure and also improved the thermal shock resistance.

In the thermal shock test, uniform coarse grained castings gave better results than uniform fine grained castings.

So far, we have only talked about the relationship of properties and structure. Well, there are effects, too, between structure and dimensions. The first bucket which we have examined shows that it is not just the dimensional control in casting which is important, it is also dimensional stability in the product after it is applied. Aside from the actual properties, if you have grain size variations in a stressed or heated part, warpage in use will cause rejection of the piece and will give precision castings a bad name.

It means too that, if you are going to heat treat some of these castings followed by quenching, some of the pieces are going to warp because fine grained section will respond one way, coarse grain structure will respond another way. If you have a mixed grain size from one casting to another or from one part of a casting to another, you are subject to warpage, especially in the thin sections usually found among precision castings.

Surface is also very much subject to your casting conditions. I recall experiments in which we cast a 2 percent manganese stellite. Following fairly standard practice, we found a little slag formation due to the formation of a manganese silicate slag on the surface in casting.

When we tried a 4 percent Mn alloy, we simply got an object that didn't look like a casting at all, it was completely shapeless. It appeared that we couldn't cast a 4 percent manganese stellite alloy.

On the other hand, by dropping the pouring temperature way down and by dropping the mold temperature a little bit, we were able to cast a 4 percent manganese casting.

It makes a difference, based on casting conditions, as mentioned a short time ago, in the quantity of gas dissolved and the amount of gas available on solidification.

You may encounter difficulties in soundness and also in surface finish where the gas happens to come out on the surface. Thus, from all of these points of view, control of casting conditions is very important. You may have to control hot or cold, you may be looking for a coarse grain, you may be looking for a fine grain size, you may be looking for something in between, but whatever you do, it will have an effect on your product in a very, very important way.

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The ceramics and minerals research department of Armour Research Foundation of Illinois Institute of Technology, Chicago, has been reorganized as a result of its increased scope of activities.

Dr. Einer P. Flint, department manager, announced that a new research section has been created and names of three of the four previously-existing sections have been changed.

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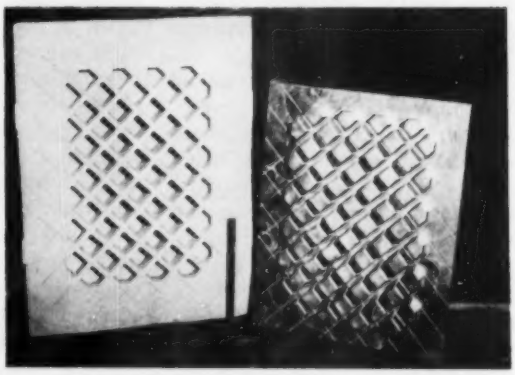

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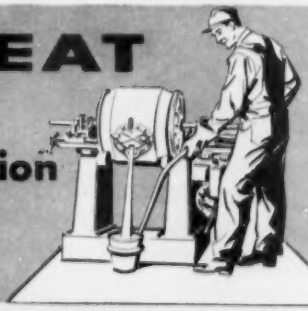

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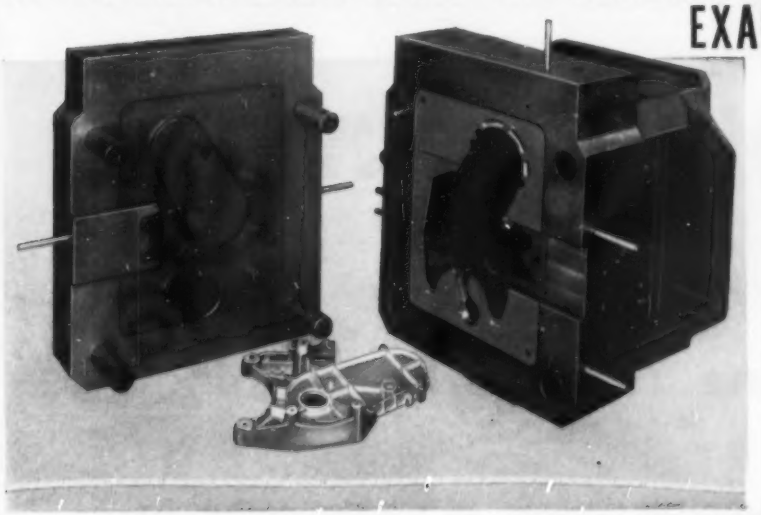

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